JOURNAL
OF THE
WASHINGTON ACADEMY OF SCIENCES

VOL. 37 AUGUST 15, 1947 No. 8

ETHNOLOGY.—*Arikara glassworking.*[1] MATTHEW W. STIRLING, Bureau of American Ethnology.

A unique industry among American Indians, that of glassworking, was developed among the sedentary tribes of the Upper Missouri in the latter part of the eighteenth century and was carried on for perhaps a century. Although practiced among a number of different tribes, it is evident that the art was highly secret, and knowledge of it was confined to only a few individuals. Probably because of this fact satisfactory descriptions of the process are lacking, although it is mentioned by many early writers who visited the region and were impressed by the fact of its existence.

Joseph Garreau, who had lived for many years previously among the Upper Missouri tribes and who had an Arikara wife, explained the process of manufacturing glass ornaments to Lewis and Clark in 1804. As recorded by these American explorers the description is none too clear, but it gives nevertheless the general principles of the techniques:

Mr. Garrow a Frenchman who has lived many years with the Ricares & Mandans shewed us the process used by those Indians to make beads. the discovery of this art these nations are said to have derived from the Snake Indians who have been taken prisoners by the Ricaras. the art is kept a secret by the Indians among themselves and is yet known to but few of them. the Process is as follows.—Take glass of as many different colours as you think proper, then pound it as fine as possible, putting each colour in a separate vessel. wash the pounded Glass in several waters throwing off the water at each washing, continue this opperation as long as the pounded glass stains or colours the water which is poured off and the residuum is then prepared for use. you then provide an earthen pot of convenient size say of three gallons which will stand the fire; a platter also of the same material sufficiently small to be admitted in the mouth of the pot or jar. the pot has a nitch in it's edge through which to watch the beads when in blast. You then provide some well seasoned clay with a proportion of sand sufficient to prevent it's becoming very hard when exposed to the heat. this clay must be tempered with water until it is about the consistency of common doe. of this clay you then prepare, a sufficient number of little sticks of the size you wish the hole through the bead, which you do by roling the clay on the palm of the hand with your finger. this done put those sticks of clay on the platter and expose them to red heat for a few minutes when you take them off and suffer them to cool. the pot is also heated to cles [cleanse] it perfectly of any filth it may contain. small balls of clay are also mad[e] of about an ounce weight which serve as a pedestal for a bead. these while soft ar destributed over the face of the platter at su[c]h distance from each other as to prevent the beads from touching. some little wooden paddles are now provided from three to four inches in length sharpened or brought to a point at the extremity of the handle. With this paddle you place in the palm of the hand as much of the wet pounded glass as is necessary to make the bead of the size you wish it. it is then arranged with the paddle in an oblong from [form], laying one of those little stick of clay crosswise over it; the pounded glass by means of the paddle is then roped in cilindrical form arround the stick of clay and gently roled by motion of the hand backwards an forwards untill you get it as regular and smooth as you conveniently can. if you wish to introduce any other colour you now purforate the surface of the bead with the pointed end of your little paddle and fill up the cavity with other pounded glass of the colour you wish forming the whole as regular as you can. a hole is now made in the center of the little pedestals of clay with the handle of your shovel sufficiently large to admit the end of the stick of clay around which the bead is formed. the beads are then arranged perpendicularly on their pedestals and little distance above them supported by the little sticks of clay to which they are attached in the manner before mentioned. thus arranged the platter is deposited on burning coals or hot embers and the pot reversed with the apparture in its edge turned towards covers the whole. dry wood pretty much doated [doughted] is then

[1] Received April 22, 1947.

plased arron [around] the pot in sush manner as compleatly to cover it. [It] is then set on fire and the opperator must shortly after begin to watch his beads through the apparture of the pot le[s]t they should be distroyed by being over heated. he suffers the beads to acquire a deepred heat from which when it passes in a small degree to a pailer or whitish red, or he discovers that the beads begin to become pointed at their extremities he removes the fire from about the pot and suffers the whole to cool gradually. the pot is then removed and the beads taken out. the clay which fills the hollow of the beads is picked out with an awl or nedle. the beads is then fit for uce. the Indians are extreemly fond of the large beads formed by this process. they use them as pendants to their years, or hair and sometimes wear them about their necks.[2]

This description apparently refers only to the manufacture of beads and not to the flatwork in which a greater amount of originality was displayed.

Washington Matthews, who was stationed at military posts on the Upper Missouri from 1865 to 1872, states that the art was still practiced occasionally at that time. He said that he had heard the process described by Indians essentially as given by Lewis and Clark. He added that formerly the articles manufactured consisted chiefly of two kinds—large globular or ellipsoidal beads; and flat, irregularly triangular plates or pendants, glazed only on one side and having a hole in the apex. In his time the art was mostly confined to the making of the flat, triangular pendants. Referring to the description given by Garreau to Lewis and Clark, Matthews says:

From this quotation however, which is in part ambiguous, the inference might be drawn that the ornaments, when completed, consist entirely of glass. Such is not the case in those I have seen; on the contrary, they consist of a core of baked earth covered with a thin shell of glass; and they have the appearance of having been perforated before heat was applied. But, in the matter of making the holes, the process may have been changed, or there may have been two ways of doing it.[3]

As will appear later, both Matthews and Garreau were correct, since there is clear evidence that the process did change.

George Catlin, writing of the Mandan in 1837, says:

In addition to this [potter's] art which I am sure belongs to no other tribe on the continent, these people have also, as a secret with themselves, the extraordinary art of manufacturing a very beautiful and lasting kind of blue glass beads, which they wear on their necks in great quantities and decidedly value above all others that are brought among them by the fur traders. This secret is not only one that the traders did not introduce among them, but one which they cannot learn from them; and at the same time, beyond a doubt an art that has been introduced among them by some civilized people, as it is yet unknown to other Indian tribes in that vicinity or elsewhere. Of this interesting fact, Lewis and Clarke gave an account thirty-three years ago, at a time when no traders or other white people had been among the Mandans to have taught them so curious an art.[4]

Catlin used this as one of his arguments to support his pet theory of the Welsh origin of the Mandans. In reference to his statement Matthews sagely remarks:

It is surprising that Mr. Catlin, after reading the passages from Lewis and Clarke (and he leaves us to infer that he has read them) could state that the art of making these beads was confined to the Mandans: that it was unknown to the traders; that it was beyond doubt introduced by civilized people; and that no traders or other whites had been among these Indians before the time of Lewis and Clarke's visit.[5]

Maximilian, referring to his visit to the Upper Missouri in 1833, says:

Among the Mandans, Minitaries and Arikkaras the women as Lewis and Clarke relate, manufacture beads from coloured glass. They powder those which they have obtained from the traders and mould them into different shapes. The custom is, however, no longer common.[6]

Hayden briefly mentioned the art among the Arikara, whom he visited in 1854:

They also possess the art of melting beads of different colors, and casting them in moulds of clay for ornaments, some of which are very handsome.[7]

Denig who was engaged in the fur trade on the Missouri from 1833 to 1854 reported:

They (the Arikara) also have the art of melting beads of different colors and casting them in

[2] Lewis and Clark, 1904, vol. 1, pp. 272–274.
[3] Matthews, 1877, pp. 19–23.
[4] Catlin, 1848, vol. 2, p. 201.
[5] Matthews, 1877, p. 22.
[6] Maximilian, 1843, p. 348.
[7] Hayden, 1862, p. 354.

molds of clay for ear and other ornaments of various shapes, some of which are very ingeniously done. We have seen some in shape and size as drawn in plate 65, the ground-work blue, the figure white, the whole about ¼ inch thick and presenting a uniform glazed surface.[8]

Denig's illustration shows one of the triangular pendants with the inlaid figure of a woman, simply drawn.

George Bird Grinnell refers to the art as practiced by the Cheyenne:

Long, long ago, we are told, the Cheyennes manufactured for themselves what might be called beads, but perhaps were small charms made of some vitrified substance—perhaps of pulverized glass—after the white people were met. Such beads are said to have been made within two or three generations. Many of them were fashioned in the shape of a lizard; that is, a four-legged object with a long tail and a small head. The ceremony connected with making such objects was secret, and he who wished to possess one was obliged to go to some person who himself had been taught the ceremony, and to ask that person to teach him how to make one. A payment was made for the service. It is believed that in old times, long before the whites came, these beads were made from the quartz sand found on ant-hills, and that this was melted in an earthen pot. The secret of making them now seems to be lost.

In later times they melted the glass, with which to make the beads, in the ladles used in melting lead for their bullets. These ornaments or charms were made in various shapes, often in the form of a lizard, as said, or flat on one side and round on the other. Sometimes they had a perforation through which a string might be passed; at other times merely a constriction between two ends about which a string was tied. The mold was made of clay.

The first European beads possessed by the Cheyennes were white, coarse, and imperfect in finish, but were highly valued. Few of these are now in existence.[9]

In another place he states:

On the gently rising land to the west of the Porcupine village, the Cheyenne are said to have planted their corn . . . the village site now stands on the farm of Yellow Lodge, a Yankton Sioux who had been told by the old people that this was a Cheyenne village. In plowing he often turned up pottery. . . . He had turned up also glass beads, which he described as like the charms or beads which we know the Cheyennes used to manufacture—in later times perhaps from pounded glass like those said to have been made by the Mandan.[10]

[8] Denig, 1930, p. 413 and pl. 65.
[9] Grinnell, 1924, vol. 1, p. 223.
[10] Grinnell, 1918, p. 369.

In the early collections of the U. S. National Museum there is one of the triangular pendants, bleached apparently from exposure, bearing the label "Sioux stone charm" (Fig. 1, *f*). It may well be a specimen discovered in this manner by the Sioux.

James Mooney, referring to the period at the close of the nineteenth century, says in reference to the Cheyenne:

At least one man among them still understands the art of making beads and figures from pounded glass as formerly practised by the Mandan.[11]

As late as 1923, Melvin Gilmore obtained a brief account of glassworking from two old Arikara women. He also obtained from them a stone mortar said to have been used for the pulverizing of glass for reworking. When the informants were asked why the Arikara formerly went to the trouble of destroying the trader's beads in order to make them over, one of the women replied:

The traders of that time brought our people very large beads, as large as plums, and our people did not like them. For that reason they pulverized them, and worked them over into beads no larger than chokecherries, and also into pendants and other decorative forms.[12]

Regarding the process of manufacture these informants told Gilmore that—

the trader's beads were first pulverized, the different colored beads separately. Then they prepared a firing pan from the brass rim or binding of an old musket on which was laid a bed of sand. The powdered glass was moistened with water; then with a fine wooden tool this glass paste was shaped into the forms desired on the prepared bed of sand. The firing pan was carefully placed in a hot fire of dry elm wood, this wood being used because it would burn quietly without snapping or crackling. When heated to the proper temperature the glass paste became fused. Perforations were kept open by insertion of sand. When quite cooled after fusing, the beads or other objects were taken from the sand bed, and the sand was shaken out of the perforations.[13]

This account indicates that a reasonably accurate memory of the art was retained at a date at least 125 years after its adoption. The explanation that the trade beads were too large for the taste of the Indians is probably incorrect, since the early accounts indicate that the reverse was true.

[11] Mooney, 1907, article "Cheyenne."
[12] Gilmore, 1924, p. 20.
[13] Gilmore, 1924, p. 21.

The earliest reference to this subject known to the writer is that by Pierre Tabeau, who lived among the Arikara in 1802. Although brief it is of considerable importance. He says, after discussing the duties and occupations of women:

> A Spanish prisoner taught them how to melt our glass beads and to mould them into a shape that pleases them. This art which is as yet unknown to them is practised only secretly and still passes for a supernatural talent.[14]

There were three theories (not counting Catlin's Welsh theory) of the origin of the art. Of these, Tabeau's early statement that it was learned by the Indians from a Spanish prisoner seems the most probable. Garreau's statement that it came from the Shoshone seems improbable unless the above-mentioned Spanish prisoner came among these Indians from the Pacific coast.

Washington Matthews conjectured that the art was very old; that it was, in fact, an aboriginal invention discovered before the coming of the whites. He based this theory on the fact that it was highly improbable that any of the French traders who had been among the Indians would have had any knowledge of glassworking, and on Indian tradition that the art was very old. He states that the Indians had told him "with uncertainty" that in former times they found glass in the hills and pounded it for their beads.

The Indians might have had reference to obsidian or more likely the substance Culbertson refers to in his journal on the badlands of Dakota:

> I was much surprised to see, running through different parts of the clay surface, vertical strata of a singular looking substance something like melted glass and almost transparent; the strata are about one-fourth of an inch in thickness and do not lie in a series of strata, but between each stratum there are several inches of the clay . . . while in many places the surface is covered with small pieces. . . . [15]

Another reason Matthews gives for his theory of the antiquity of the practice is that—

> they used the triangular pendants, not as ornaments only, but as evidence of betrothal, as long ago as the oldest men can remember. When a girl was promised in marriage in her infancy by her parents, as was not infrequently done, one of these pendants was tied to her forelock so as to hang down over her forehead. When the promise was fulfilled, the husband removed the pendant and threw it away.[16]

The glasslike substance referred to by Culbertson was probably calcite. It seems quite certain that the firing method used by the Indians would not produce temperatures sufficiently high to fuse calcite, obsidian, or any other mineral substance occurring naturally in the region. It would appear therefore that any aboriginal practice of glassworking was beyond the capacities of the Indians.

In the summer of 1923 the writer conducted archeological investigations at the site of the Arikara village visited in 1804 by Lewis and Clark. During excavations in the cemetery of this village a considerable number of examples of this native glasswork were recovered. These consisted of beads of various sizes and flatwork ornaments. The majority of the beads were of solid, translucent, turquoise-blue glass, the few exceptions being either cloudy white or black. None of these contained inlay decorations. The smaller beads are of an oval shape with the perforations disproportionally large and having sharp, rough edges. Some of these are of excellent workmanship, while others are very inferior, being porous and full of impurities. The latter are dull in color and easily broken. These beads were all of the same blue color as the flatwork.

The large beads are of two shapes, ellipsoidal and roughly globular. The former have comparatively small perforations; the latter, large. The edges of the perforations are generally filled with bubbles, a characteristic seen also in the flatwork. In the burials these beads occurred sometimes in the form of necklaces, sometimes by the head, as if worn in the hair, and occasionally they were loose in leather or woven hair pouches.

The technique employed in the flat ornaments is exhibited in two shapes, triangular with rounded points, and circular.

[14] Abel, 1939, p. 149.
[15] Culbertson, 1851, p. 95.
[16] Matthews, 1877, p. 21.

The former have a hole at the apex, the latter in the center. The majority are of a solid blue color. Where two colors were used the base color is blue and the applied design is white. The usual design was for the base of the triangles to be decorated with hori-

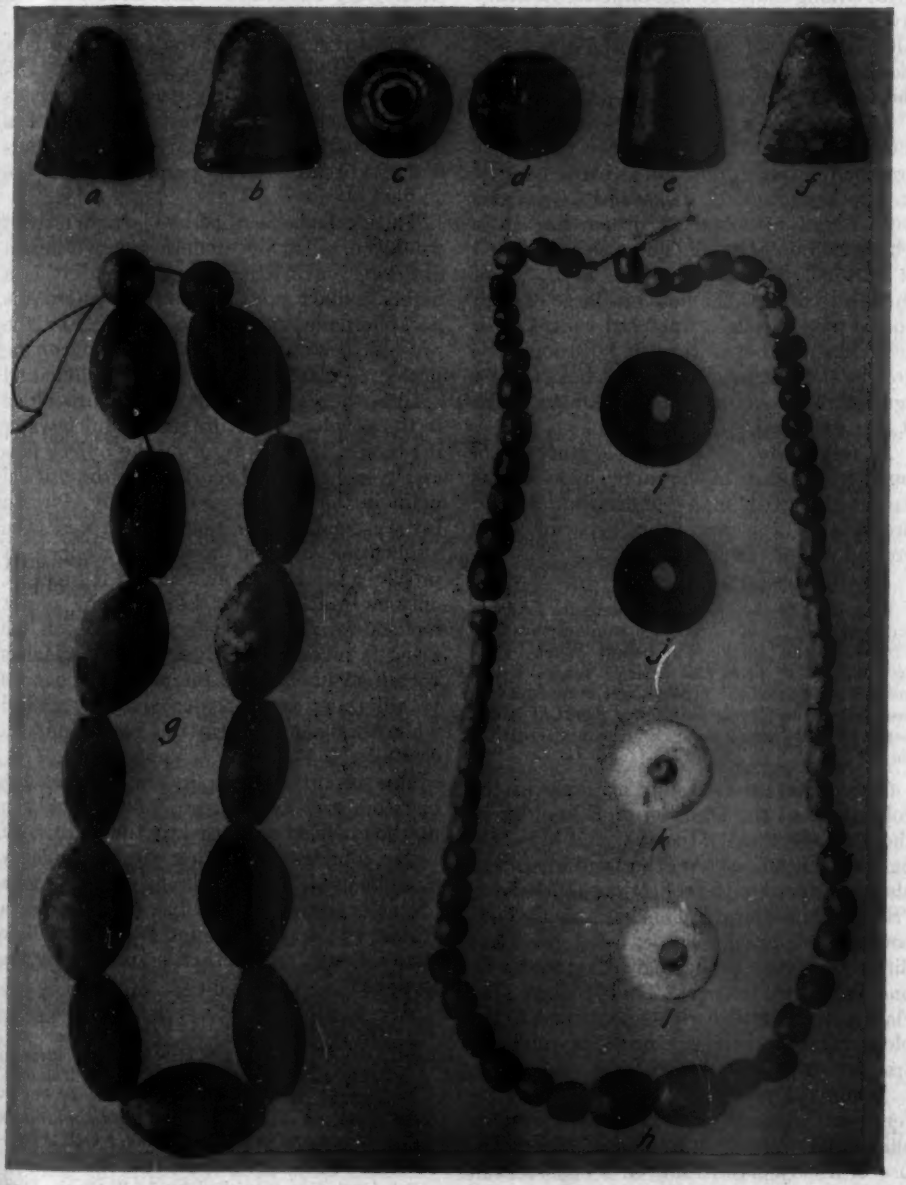

FIG. 2.—Glass beads and ornaments of Indian manufacture: *a–f*, Flatwork ornaments; *g*, *h*, turquoise-blue beads; *i*, *j*, black spherical beads; *k*, *l*, white spherical beads. Three-fourths natural size.

zontally placed bars and dots (Fig. 1, *a*, *b*, *f*); the disks with concentric circles (Fig. 1, *c*). One example of this glass was ground to an oblong shape. It was unperforated and gives the impression of imitation turquoise. All the flatwork is convex on the upper surface and typically has a glossy finish, while the under surface is dull and perfectly flat.

In one grave a single disk was found by the head of the burial, and two triangular ornaments were in position as ear pendants. In another grave 17 disks and 4 triangles were found attached as ornaments on a woven buffalo hair bag. These were fastened in a novel manner. A white bead, small enough to fit into the hole but large enough not to pass through, was used as a stay or key. The bead was threaded through the hole in the flat piece and thus held tightly against the woven surface or skin to which it was attached.

It might be added that quantities of small trade beads of the same shade of blue were found with many of the burials and presumably this was the type of bead ground up for reworking.

Matthews said:

> I had two of the triangular pendants made to order in 1870, by an Arickaree woman, to whom I furnished the blue glass necessary. When I gave instructions to have the articles made, I was invited to witness the process, but circumstances prevented me from doing so. One of these pendants was sent to the Smithsonian Institution.[17]

The writer located this example in the collections of the Division of Ethnology in the U. S. National Museum, and it is here figured (Fig. 1, *e*). Another specimen was also discovered in the collections labeled as a "Sioux stone charm." This has already been commented upon. These two specimens differ from the archeological examples in one important respect. They consist of a clay core, enameled with glass, whereas the older examples are of pure glass and are translucent.

While the ornaments themselves are inferior to the early examples, the workmanship in one respect shows an advance. The use of a clay core results in a considerable saving of material and also greatly facilitates the process of manufacture. Aside from these two examples, no others except those found in the above-mentioned archeological excavations are known to the writer.

The ornament made for Matthews is a darker shade of blue than the other examples. This is probably because the beads he furnished for the purpose were of a darker shade than the earlier trade beads and also because of the opaque nature of the subject.

The method described by Garreau is what would be called by modern glassworkers a Sintering or Fritting process, and it is a highly skilled craft, especially where the paraphernalia used is so crude. For the process to be successful the grading of the powdered glass must be properly done and exactly the right amount of moisture added to the powdered mixture. If too much water is present, bubbles form or the object falls apart on heating. Determining the critical point in the firing as described by Garreau is the crucial point in the whole process. The application of heat must be stopped at precisely the proper moment. If it proceeds only a brief moment beyond, the object melts down. If it is stopped too soon the firing is incomplete. Even modern glaziers with instruments and temperature controls to aid them are considered highly skilled when they can perform this operation successfully.

One essential stage in the process has been omitted by Garreau. The objects can not be modeled and fused by the addition of water alone. Some other binding agency must be used. Modern glassworkers use gum arabic or some similar substance, but saliva will serve the purpose, and it might well be that this was the method employed by the Indians.[18]

[17] Matthews, 1877, p. 21.

[18] Information furnished by L. B. Clark, Division of Radiation and Organisms, Smithsonian Institution.

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ENTOMOLOGY.—*Notes on, and new species of, American moths of the genus* Filatima *Busck (Gelechiidae: Lepidoptera).*[1]

J. F. GATES CLARKE, U. S. Bureau of Entomology and Plant Quarantine.

In this paper I have assigned three species, previously unrecognized by Busck[2] and not placed in his paper on the restriction of *Gelechia*, to *Filatima*. A fourth species, referred to *Filatima*, is herein transferred, and 12 new species are described.

The drawings for this paper were made by the author.

Filatima procedes, n. sp.
Figs. 1–1b, 14

Labial palpus shining whitish buff; brush of second segment suffused with drab and irrorate with fuscous; third segment irrorate with blackish fuscous. Antenna whitish buff with blackish-fuscous annulations. Ground color of head, thorax, and forewing whitish buff, the scales tipped with cinnamon-buff and somewhat suffused with fuscous, this combination of color producing a general drab appearance; in the fold, at basal third, an ill-defined cinnamon-buff spot; discal spots, if present, small and blackish fuscous; cilia sordid whitish buff speckled with blackish fuscous; underside with rather conspicuous blackish-fuscous scaling. Hind wing shining whitish basally shading to fuscous apically; cilia yellowish fuscous; curtain scaling from underside of costa present in male. Legs whitish buff irrorate with blackish fuscous; tibial spurs blackish fuscous outwardly. Abdomen with first three segments yellowish above, remainder fuscous, edged with whitish buff; beneath whitish buff, irrorate with blackish fuscous.

Male genitalia.—Asymmetrical. Ventral lobe of left harpe stout with a large, conspicuous, strongly sclerotized tooth on the inner surface just before apex, several smaller teeth on the inner surface, and a large one at the junction of the ventral and dorsal lobes; dorsal lobe slender, fleshy. Right harpe with ventral lobe rather slender, smooth; dorsal lobe slender, fleshy. Gnathos a small hook with a few teeth on the posteroventral edge. Uncus narrow, weak. Aedeagus with a large, sharp tooth, directed forward, on left side, and a thornlike process posteriorly from the right side.

Female genitalia.—See Fig. 14.

Alar expanse, 18–20 mm.

Type.—U.S.N.M. no. 58257.

Type locality.—Presidio, Tex.

Food plant.—Salix exigua Nutt.

Remarks.—Described from the male type, three male and one female paratypes, all from the same locality. The moths emerged 22-X-1943 from larvae collected 17–IX–1943 by J. H. Russell. Paratypes in the U. S. National Museum and the British Museum.

This species is closely related to *F. saliciphaga* (Keifer) but averages lighter in color

[1] Received February 4, 1947.

[2] BUSCK, A., *Restriction of the genus* Gelechia *(Lepidoptera: Gelechiidae), with descriptions of new species.* Proc. U. S. Nat. Mus. 86: 563–593. pls. 58–71. 1939.

and smaller in size. In the male genitalia of *saliciphaga* there is a pronounced "shoulder" from the ventral edge of the ventral lobe of each harpe which is entirely lacking in *procedes*, and the toothlike processes of the aedeagus are nearly twice as large in *saliciphaga* as they are in *procedes*.

Filatima betulae, n. sp.

Figs. 2–2b, 15

Labial palpus sordid white suffused and heavily overlaid with fuscous; third segment almost wholly dark fuscous with a sprinkling of sordid white scales. Antenna dark fuscous annulated with gray. Head grayish fuscous, the scales broadly tipped with dark fuscous. Thorax and ground color of forewing brown; narrowly along costa, indistinctly on the veins and broadly on dorsum overlaid with dark fuscous-tipped grayish-fuscous scales; at apical fourth and at tornus an indistinct sordid white spot faintly indicating a transverse line; cilia light yellowish fuscous irrorate with blackish fuscous. Hind wing gray shading to fuscous around margins; cilia yellowish fuscous with darker shading at middle; curtain scaling present in male. Legs sordid white suffused and banded with blackish fuscous.

Male genitalia.—Asymmetrical. Ventral lobe of left harpe half as broad as long, terminating in three widely separated points; ventral lobe of right harpe ending in a single point. Gnathos a short hook with serrate ventroposterior edge. Aedeagus with prominent lateral point and one stout, pointed cornutus.

Female genitalia.—Ostium broad. Ductus bursae sclerotized for almost its entire length. Signum a large 2-pointed plate.

Alar expanse, 19–21 mm.

Type.—U.S.N.M. no. 58250.

Type locality.—Melrose Highlands, Mass.

Food plant.—*Betula populifolia* Marsh.

Remarks.—Described from the male type and one female paratype (5-VI and 15-VI-1931). Paratype in the U. S. National Museum.

In genitalia this species is nearest *F. roceliella* Clarke, but differs from it as follows: Both harpes of *roceliella* are nearly symmetrical while those of *betulae* are strongly asymmetrical as shown in the figure.

Filatima golovina, n. sp.

Figs. 3–3b, 21

Labial palpus white inwardly on second segment, pale ocherous in the brush and irrorate with blackish fuscous; third segment white irrorate with blackish fuscous. Antenna blackish fuscous with indistinct narrow annulations. Head sordid white, the tips of the scales narrowly edged with fuscous. Tegula fuscous basally shading to sordid white apically. Thorax and forewing sordid white, the ground color nearly obliterated by fuscous and other markings; from base, inside costa, to and including apex, ocherous scaling gradually broadening to include nearly the whole apical third of wing; a white spot on costa and another on tornus indicate an obsolete transverse fascia; discal spots generally ill-defined or absent, but when present four in number and fuscous (the females are more conspicuously marked than the males): cilia gray to grayish fuscous, irrorate with fuscous. Hind wing shining grayish fuscous basally shading to fuscous around margins; cilia yellowish fuscous; curtain scaling from underside of costa present in male. Legs white, irrorate and banded with blackish fuscous. Abdomen light fuscous above, the segments edged with white posteriorly, except the first three segments which are yellowish; beneath white broadly edged with fuscous ventrolaterally.

Male genitalia.—Asymmetrical. Ventral lobe of left harpe strongly curved and studded with small teeth on its inner surface and outer edge. Ventral lobe of right harpe deeply emarginate on ventral edge. Gnathos a short, stout hook with three or four teeth on ventroposterior edge. Aedeagus with a large pointed process from the left side and a small thornlike cornutus on the right.

Female genitalia.—The signum, though of the usual type for this genus, is unusually small in this species.

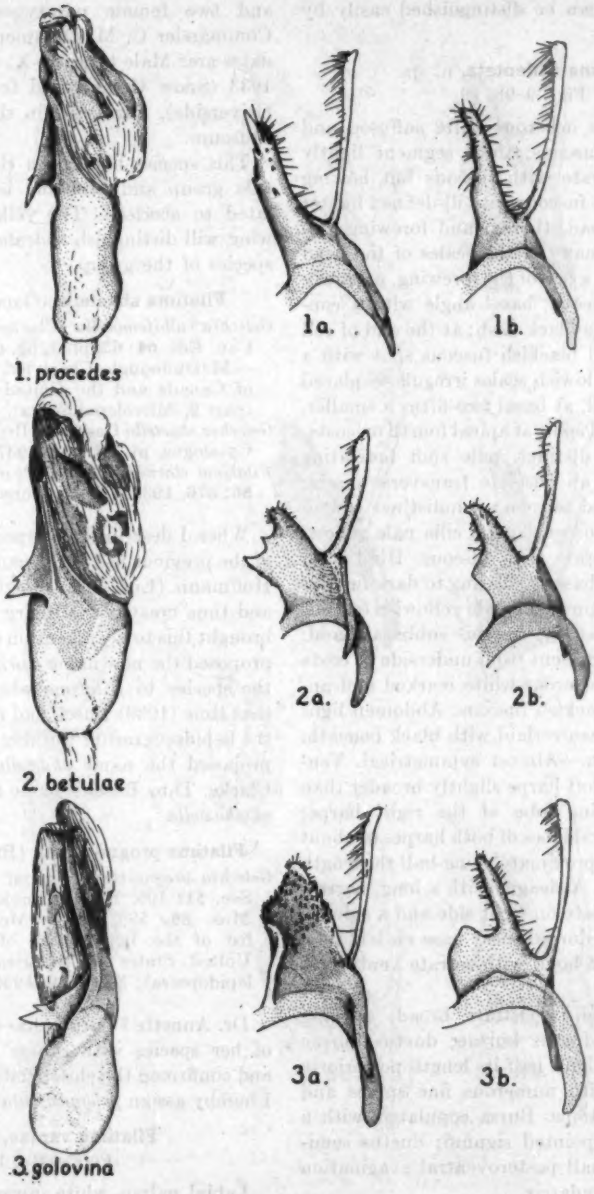
Alar expanse, 18–20 mm.

Type.—U.S.N.M. no. 58253.

Type locality.—Palm Springs, Calif.

Remarks.—Described from the male type, two male and four female paratypes from California as follows: Palm Springs, type male (2-V-1921, Karl R. Coolidge) and female (6-V-1921, Karl R. Coolidge); Dixieland, Imperial County, two males and three females (15-IV to 15-V-1922, O. C. Poling). Paratypes in the U. S. National Museum and the British Museum.

The pattern of this species is similar to that of *sperryi*, but *golovina* is much lighter in colora-



MALE GENITALIA

FIGS. 1–1b.—*Filatima procedes*, n. sp.: 1, Ventral view of aedeagus; 1a, inner surface of left harpe; 1b, outer surface of right harpe.

FIGS. 2–2b.—*Filatima betulae*, n. sp.: 2, Ventral view of aedeagus; 2a, inner surface of left harpe; 2b, outer surface of right harpe.

FIGS. 3–3b.—*Filatima golovina*, n. sp.: 3, Lateral view of aedeagus to show spinous process; 3a, inner surface of left harpe; 3b, outer surface of right harpe.

tion. The two can be distinguished easily by their genitalia.

Filatima tridentata, n. sp.
Figs. 9–9b, 19

Labial palpus ocherous-white suffused and overlaid with fuscous; third segment lightly and finely irrorate with fuscous but lacking annuli. Antenna fuscous with ill-defined lighter annulations. Head, thorax, and forewing yellowish brown; many of the scales of the head and thorax, and a few of the forewing, narrowly tipped with fuscous; basal angle with a conspicuous, oblique black dash; at the end of cell a poorly defined blackish fuscous spot with a scattering of yellowish scales irregularly placed around it; in cell, at basal two-fifths a smaller, similarly colored spot; at apical fourth on costa, a narrow, but distinct, pale spot indicating the position of an obsolete transverse fascia; around apex and termen an indistinct row of small blackish fuscous spots; cilia pale yellowish fuscous irrorate with fuscous. Hind wing grayish fuscous basally shading to dark fuscous around the margins; cilia pale yellowish fuscous with a faint, narrow, fuscous subbasal band; curtain scaling present from underside of costa of male. Legs ocherous-white marked and annulated with blackish fuscous. Abdomen light yellowish fuscous overlaid with black beneath.

Male genitalia.—Almost symmetrical. Ventral lobe of the left harpe slightly broader than the corresponding lobe of the right harpe; dorsal and ventral lobes of both harpes of about equal length, approximately one-half the length of the tegumen. Aedeagus with a long, narrow three-pointed plate on right side and a spinous process, turned dorsad, near base on left side. Gnathos a short hook with serrate ventroposterior edge.

Female genitalia.—Ostium broad, opening into the wide ductus bursae; ductus bursae sclerotized for about half its length posteriorly and studded with numerous fine spines and minute scobinations. Bursa copulatrix with a very wide two-pointed signum; ductus seminalis from a small posteroventral evagination of the bursa copulatrix.

Alar expanse, 20–23 mm.

Type.—U.S.N.M. no. 58249.

Type locality.—Snow Creek, Riverside County, Calif.

Food plant.—"Willow."

Remarks.—Described from the male type and two female paratypes, all reared by Commander C. M. Dammers. The emergence dates are: Male type, 21-X, and female, 21-X-1933 (Snow Creek), and female, 26-IX-1938 (Riverside). Paratypes in the U. S. National Museum.

This species belongs in the *serotinella-abactella* group and probably is more nearly related to *abactella*. The yellowish-brown forewing will distinguish *tridentata* from the other species of the group.

Filatima shastella (Gaede), n. comb.

Gelechia albifemorella Clarke (*not* Hoffmann), Can. Ent. **64**: 65, pl. 2, fig. 6, pl. 3, fig. 5. 1932.—McDunnough, Check list of the Lepidoptera of Canada and the United States of America (part 2, Microlepidoptera). No. 8123. 1939.

Gelechia shastella Gaede, *in* Bryk, Lepidopterorum Catalogus, pt. 79: 212. 1937.

Filatima clarkella Busck, Proc. U. S. Nat. Mus. **86**: 576. 1939. (New synonymy.)

When I described this species I was unaware of the previous use of the name *albifemorella* by Hoffmann (Ent. Zeit. Stettin **28**: 204. 1867), and thus created a primary homonym. Busck brought this to my attention several years later, proposed the new name *clarkella*, and assigned the species to *Filatima* where it belongs. At that time (1939) Busck had not seen part 79 of the Lepidopterorum Catalogus in which Gaede proposed the name *shastella* for *albifemorella* Clarke. Thus Busck's name falls as a synonym of *shastella*.

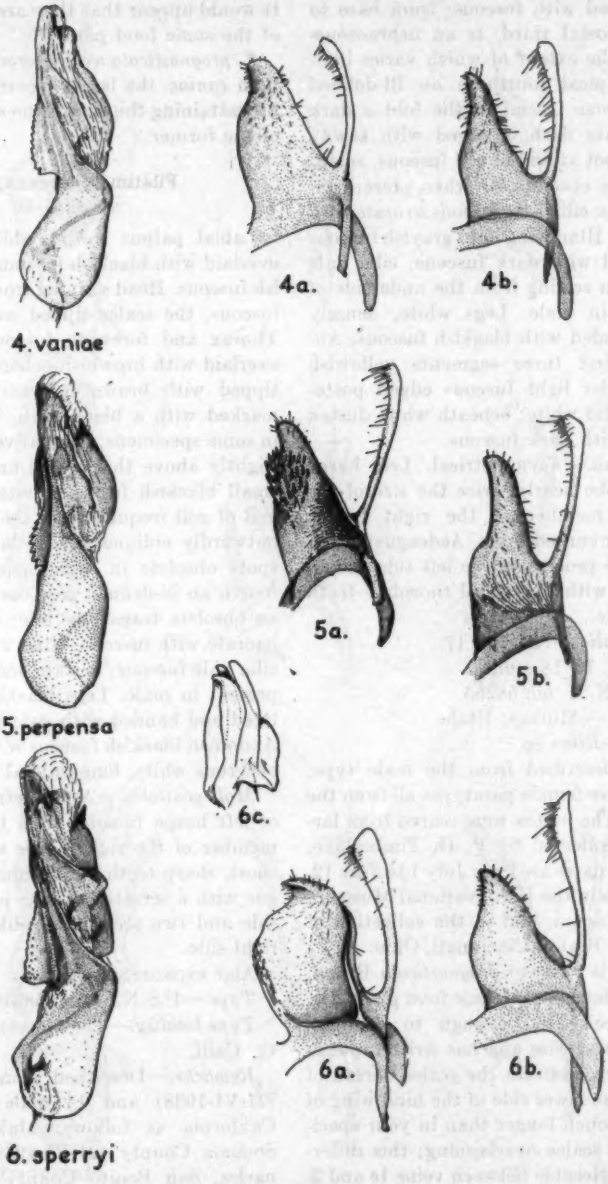
Filatima prognosticata (Braun), n. comb.

Gelechia prognosticata Braun, Trans. Amer. Ent. Soc. **51**: 195. 1925.—Busck, Proc. U. S. Nat. Mus. **86**: 589. 1939.—McDunnough, Check list of the Lepidoptera of Canada and the United States of America (part 2, Microlepidoptera), No. 8119. 1939.

Dr. Annette F. Braun has compared the type of her species with *vaniae* (described below) and confirmed the close relationship of the two. I hereby assign *prognosticata* to *Filatima*.

Filatima vaniae, n. sp.
Figs. 4–4b, 17

Labial palpus white inwardly, suffused and irrorate with fuscous in brush and exteriorly on second segment; third segment almost entirely overlaid with blackish fuscous. Antenna fuscous with poorly defined lighter annulations. Head pale gray, the scales tipped with fuscous. Thorax and forewing very pale gray to whitish,



MALE GENITALIA

FIGS. 4–4b.—*Filatima vaniae*, n. sp.: 4, Ventral view of aedeagus; 4a, inner surface of left harpe; 4b, outer surface of right harpe.

FIGS. 5–5b.—*Filatima perpensa*, n. sp.: 5, Ventral view of aedeagus; 5a, inner surface of left harpe; 5b, outer surface of right harpe.

FIGS. 6–6c.—*Filatima sperryi*, n. sp.: 6, Ventral view of aedeagus; 6a, inner surface of left harpe; 6b, outer surface of right harpe; 6c, ventrolateral aspect of uncus showing lateral rods.

the scales tipped with fuscous; from base to apex, in the costal third, is an ochraceous-tawny shade, the extent of which varies individually; at apical fourth is an ill-defined whitish transverse fascia; in the fold a dark fuscous, elongate dash is edged with tawny scales; discal spot at end of cell fuscous, small; remaining spots obsolete, or when present indistinct, fuscous; cilia pale fuscous irrorate with darker fuscous. Hind wing light grayish fuscous narrowly edged with dark fuscous; cilia pale fuscous; curtain scaling from the underside of costa present in male. Legs white, densely dusted and banded with blackish fuscous. Abdomen with first three segments yellowish above, remainder light fuscous edged posteriorly with sordid white; beneath white dusted and suffused with dark fuscous.

Male genitalia.—Asymmetrical. Left harpe with ventral lobe nearly twice the size of the corresponding member of the right harpe. Gnathos a long curved hook. Aedeagus with a serrate carinate process on the left side and an elongate plate with two small thornlike teeth on the right side.

Female genitalia.—See Fig. 17.

Alar expanse, 15–18 mm.

Type.—U.S.N.M. no. 58255.

Type locality.—Murray, Utah.

Food plant.—*Ribes* sp.

Remarks.—Described from the male type, one male and five female paratypes all from the type locality. The moths were reared from larvae on *Ribes* collected by P. H. Timberlake. The emergence dates are from July 1 to July 12, 1913. Paratypes in the U. S. National Museum, the British Museum, and in the collection of Dr. Annette F. Braun, Cincinnati, Ohio.

This species is close to *prognosticata* Braun, and the larvae feed on the same food plant. Dr. Braun has been kind enough to compare *vaniae* with her species and has written me as follows: "In *prognosticata* the scales dorsad of the fringe on the lower side of the hind wing of the male, are much longer than in your specimen, with the scales overlapping; this difference is most noticeable between veins 1c and 2. Your specimen has these scales short and not overlapping. Otherwise the specimens, as to wing markings and palpi, are identical, except that yours are smaller and paler. The scaling of the hind wing of yours is more like that of *xanthuris* Meyrick than it is like *prognosticata*. It would appear that they are distinct, in spite of the same food plant."

F. prognosticata averages considerably larger than *vaniae*, the largest specimen of the latter just attaining the size of the smallest specimen of the former.

Filatima perpensa, n. sp.
Figs. 5–5b

Labial palpus sordid white, mottled, and overlaid with blackish fuscous. Antenna blackish fuscous. Head varying from grayish to light fuscous, the scales tipped with dark fuscous. Thorax and forewing fuscous, streaked and overlaid with brownish-ocherous scales; tegula tipped with brownish ocherous; basal angle marked with a black dash, but this obsolete in some specimens; on anal vein at basal third, slightly above this in cell and at end of cell, small blackish fuscous spots; the one at the end of cell frequently in the form of a short, outwardly oblique, broad dash and all of the spots obsolete in some specimens; at apical fourth an ill-defined pale costal spot indicates an obsolete transverse line; cilia pale fuscous irrorate with fuscous. Hind wing dark fuscous; cilia pale fuscous; curtain scaling on underside present in male. Legs blackish fuscous annulated and banded with pale yellowish fuscous. Abdomen blackish fuscous with a broad, sordid ocherous white, longitudinal median area.

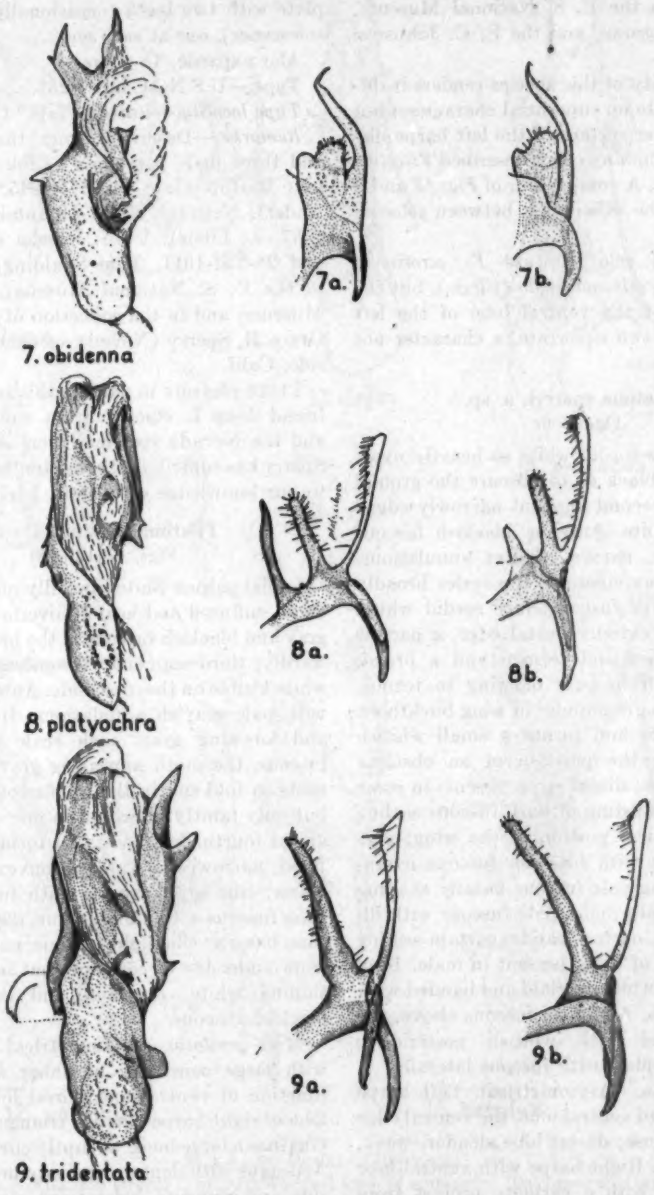
Male genitalia.—Asymmetrical. Ventral lobe of left harpe broader than the corresponding member of the right harpe and studded with short, sharp teeth on its inner surface. Aedeagus with a serrate carinate process on the left side and two strong thornlike cornuti on the right side.

Alar expanse, 18–22 mm.

Type.—U.S.N.M. no. 58248.

Type locality.—The Geysers, Sonoma County, Calif.

Remarks.—Described from the male type (21-VI-1938) and 14 male paratypes from California as follows: Male, The Geysers, Sonoma County (21-VI-1938); 7 males, Pinnacles, San Benito County (May and June dates); male, Beaumont (21-VII-1935); 2 males, Las Lomas Ranch, Sonoma County (30-V-1936); male, Hawthorne (13-VI-1937); male, Palm Springs (10-VI-1937); male, Glen Ellen (10-VII-36). All were collected by E. C. Johnston.



MALE GENITALIA

FIGS. 7–7b.—*Filatima obidenna*, n. sp.: 7, ventral view of aedeagus; 7a, inner surface of left harpe; 7b, outer surface of right harpe.

FIGS. 8–8b.—*Filatima platyochra*, n. sp.: 8, Ventral view of aedeagus; 8a, inner surface of left harpe; 8b, outer surface of right harpe.

FIGS. 9–9b.—*Filatima tridentata*, n. sp.: 9, Ventral view of aedeagus; 9a, inner surface of left harpe; 9b, outer surface of right harpe.

Paratypes in the U. S. National Museum, the British Museum, and the E. C. Johnston collection.

The variability of this species renders it difficult to separate on superficial characters, but the spinose inner surface of the left harpe distinguishes it from any other described *Filatima* except *golovina*. A comparison of Figs. 3 and 5 shows clearly the differences between *golovina* and *perpensa*.

The nearest relatives are *F. serotinella* (Busck) and *F. gilvomaculella* (Clem.), but the ventral edge of the ventral lobe of the left harpe of these two is serrate, a character not found in *perpensa*.

Filatima sperryi, n. sp.
Figs. 6–6c

Labial palpus sordid white so heavily overlaid with dull black as to obscure the ground color; apex of second segment narrowly edged with sordid white. Antenna blackish fuscous with indistinct, narrow, lighter annulations. Head and thorax cinerous, the scales broadly tipped with dark fuscous; face sordid white. Forewing with extreme costal edge, a narrow line around apex and termen and a broad, elongate area from base of wing to tornus, blackish fuscous; remainder of wing buckthorn brown; on costa and tornus a small whitish spot indicating the position of an obsolete transverse fascia; discal spots absent; in some specimens is a dusting of dark fuscous scaling in the light apical portion of the wing; cilia grayish fuscous with blackish fuscous irrorations. Hind wing pale fuscous basally shading to fuscous apically; cilia pale fuscous with ill-defined, darker, narrow bands; curtain scaling from underside of costa present in male. Legs shining creamy white overlaid and banded with blackish fuscous. Abdomen fuscous above, the segments edged with whitish posteriorly; creamy white below with fuscous laterally.

Male genitalia.—Asymmetrical. Left harpe with a very broad ventral lobe, the ventral edge of which is rugose; dorsal lobe slender, weak, dilated distally. Right harpe with ventral lobe triangular and with a carinate process from base; dorsal lobe slender, weak. Gnathos a long, slender hook. Uncus with narrow, flattened, lateral, sclerotized processes projecting beyond distal end. Aedeagus with long sawlike process on left side and an elongate, narrow sclerotized plate with two teeth (occasionally one by obsolescence), one at each end.

Alar expanse, 18–21 mm.

Type.—U.S.N.M. no. 58251.

Type locality.—Barton Flats,[3] Calif.

Remarks.—Described from the male type and three male paratypes as follows: California: Barton Flats (4-VIII-1945, A. L. Melander); Nevada: White Mountains (10-VIII-1937, A. Little); Utah: Eureka (16-VII-1911 and 28-VII-1911, Tom Spalding). Paratypes in the U. S. National Museum, the British Museum, and in the collection of John L. and Grace H. Sperry (Nevada specimen) of Riverside, Calif.

I take pleasure in naming this species for my friend John L. Sperry, from whom the type and the Nevada specimen were received. Mr. Sperry has contributed consistently and greatly to our knowledge of western Lepidoptera.

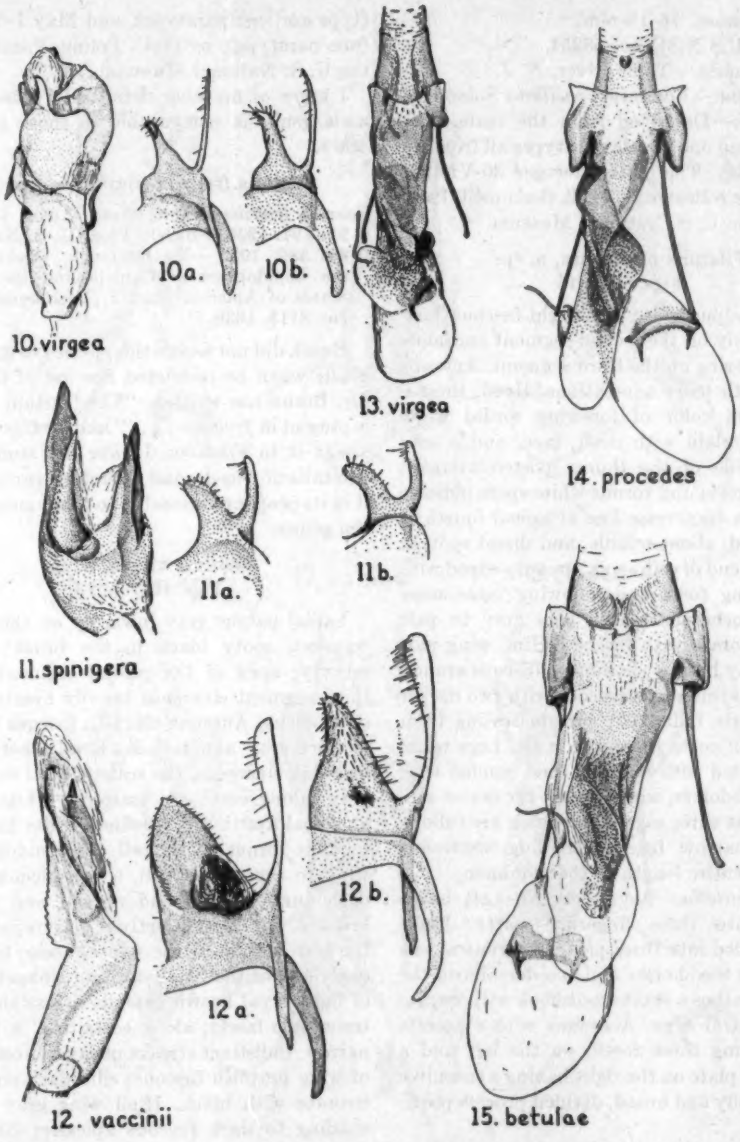
Filatima vaccinii, n. sp.
Figs. 12–12b, 20

Labial palpus white inwardly on second segment, suffused and heavily overlaid with dark gray and blackish fuscous in the brush and outwardly; third segment with only a fine line of white visible on the inner side. Antenna fuscous with pale grayish annulations. Head, thorax, and forewing gray, each scale tipped with fuscous, the moth appearing gray; four small spots on fold and in the cell fuscous if present, but only faintly indicated in one specimen; at apical fourth, from costa to tornus, an ill-defined narrow, outwardly convex transverse fascia; cilia gray irrorate with fuscous. Hind wing fuscous with a brassy hue, darker apically than basally; cilia light fuscous; curtain scaling from underside of costa present in male. Legs shining white, overlaid, and banded with blackish fuscous.

Male genitalia.—Asymmetrical. Left harpe with large concavity on inner surface near junction of ventral and dorsal lobes. Ventral lobe of right harpe narrow, triangular, smooth. Gnathos a large hook, abruptly curved distally. Aedeagus with dentate carinate process on left side and elongate, sclerotized plate with one thornlike process distally on right side.

Female genitalia.—See Fig. 20.

[3] The exact location of Barton Flats is not clear, but presumably it refers to the locality in Fresno County, near Fresno.



MALE AND FEMALE GENITALIA

FIGS. 10–10b.—*Filatima virgea*, n. sp.: 10, Ventral view of aedeagus; 10a, inner surface of left harpe; 10b, outer surface of right harpe.

FIGS. 11–11b.—*Filatima spinigera*, n. sp.: 11, Ventral view of aedeagus; 11a, inner surface of left harpe; 11b, outer surface of right harpe.

FIGS. 12–12b.—*Filatima vaccinii*, n. sp.: 12, Ventral view of aedeagus; 12a, inner surface of left harpe; 12b, outer surface of right harpe.

FIG. 13.—*Filatima virgea*, n. sp.: Female genitalia, ventral view.

FIG. 14.—*Filatima procedes*, n. sp.: Female genitalia, ventral view.

FIG. 15.—*Filatima betulae*, n. sp.: Female genitalia, ventral view.

Alar expanse, 16–18 mm.

Type.—U.S.N.M. no. 58254.

Type locality.—Toms River, N. J.

Food-plant.—*Vaccinium vacillans* Solander.

Remarks.—Described from the male type, one male and one female paratypes all from the same locality. The moths emerged 30-VI-1923 from larvae collected by H. B. Scammell. Paratypes in the U. S. National Museum.

Filatima platyochra, n. sp.
Figs. 8–8b, 16

Labial palpus white with slight fuscous dusting exteriorly on the second segment and more profuse dusting on the third segment. Antenna fuscous with paler annulations. Head, thorax, and ground color of forewing sordid white heavily overlaid with drab; face, and a spot on each side of the thorax posterolaterally, white; on costa and tornus white spots indicate an obsolete transverse line at apical fourth; a dash in fold, about middle, and discal spots at center and end of cell, sepia, broadly edged with white; along costa and following veins some brownish ocherous scales; cilia gray to pale fuscous irrorate with fuscous. Hind wing pale shining gray basally shading to fuscous around the margins; cilia pale fuscous with two darker bands faintly indicated; curtain scaling from underside of costa present in male. Legs white lightly dusted with fuscous; tarsi banded with fuscous. Abdomen white except for dorsal surfaces of first three segments, which are yellowish, and narrow fuscous shading ventrolaterally the entire length of the abdomen.

Male genitalia.—Asymmetrical. Left harpe divided into three fingerlike parts. Right harpe divided into three parts, the ventral one of which is the shorter and the dorsal arm the longer. Gnathos a short stout hook with serrate posteroventral edge. Aedeagus with a serrate edge, bearing three teeth, on the left and a sclerotized plate on the right having a thornlike tooth distally and broad, divided process proximally.

Female genitalia.—See Fig. 16.

Alar expanse, 17–18 mm.

Type.—U.S.N.M. no. 58256.

Type locality.—Dixieland, Imperial County, Calif.

Remarks.—Described from the male type and two female paratypes, all from the type locality. These were collected April 15–30, 1922 (type and one paratype), and May 1–15, 1922 (one paratype), by O. C. Poling. Paratypes in the U. S. National Museum.

I know of no other described *Filatima* with male genitalia comparable to those of *platyochra.*

Filatima frugalis (Braun), n. comb.

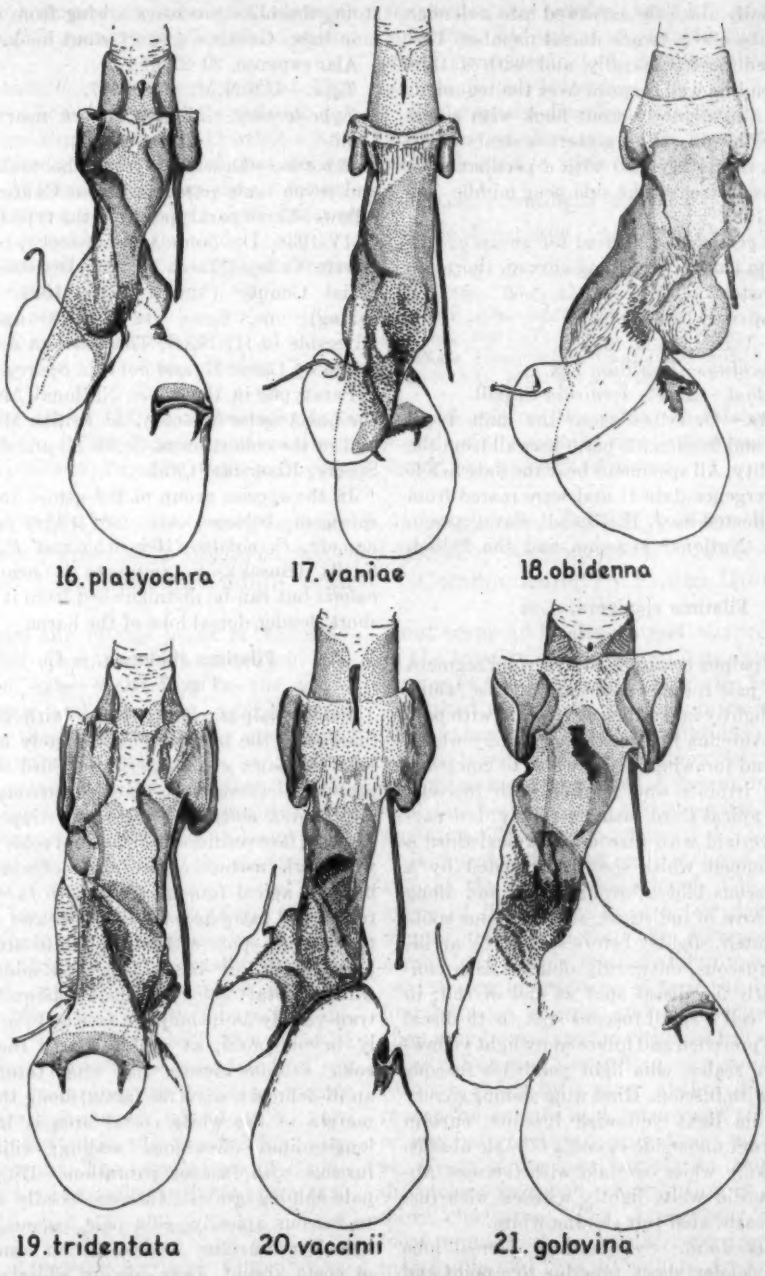
Gelechia frugalis Braun, Trans. Amer. Ent. Soc. **51**: 194. 1925.—Busck, Proc. U. S. Nat. Mus. **86**: 589. 1939.—McDunnough, Check list of the Lepidoptera of Canada and the United States of America (part 2, Microlepidoptera), No. 8118. 1939.

Busck did not assign this species to its proper genus when he restricted the use of *Gelechia.* Dr. Braun has written, "The 'curtain scaling' is present in *frugalis* . . . ," and for this reason I assign it to *Filatima.* I have not studied the genitalia of *frugalis* and, therefore, cannot place it in its proper relationship to other members of the genus.

Filatima virgea, n. sp.
Figs. 10–10b, 13

Labial palpus gray inwardly on the second segment, sooty black in the brush and exteriorly; apex of the second segment white; third segment cinereous heavily overlaid with sooty black. Antenna blackish fuscous with indistinct gray annulations. Head, thorax, and forewing cinereous, the scales tipped with dark gray; along costa are scattered white scales; at apical fourth an ill-defined white fascia extends to tornus; in the cell, from middle of the wing to the end of cell, a conspicuous black dash turns at the end of cell and extends broadly, but less distinctly to tornus just inside the termination of the white fascia; from the outer end of the black dash an elongate patch of light sayal brown extends across the white transverse fascia; along costa and in fold are narrow, indistinct streaks of sayal brown; apex of wing purplish fuscous; cilia dark cinereous, irrorate with black. Hind wing gray basally shading to dark fuscous apically; cilia light fuscous; curtain scaling from the underside of costa, present in male. Legs creamy white strongly overlaid with sooty black. Abdomen above with first three segments sordid yellowish, remainder light fuscous; beneath creamy white irrorate and edged laterally with sooty black.

Male genitalia.—Almost symmetrical. Harpes



FIGS. 16–21.—Female genitalia, ventral aspect, of: 16, *Filatima platyochra*, n. sp.; 17, *Filatima vaniae*, n. sp.; 18, *Filatima obidenna*, n. sp.; 19, *Filatima tridentata*, n. sp.; 20, *Filatima vaccinii*, n. sp.; 21, *Filatima golovina*, n. sp.

broad basally abruptly narrowed into a slender ventral lobe and a tenuis dorsal member. Uncus dilated posterodorsally and with a thin hood extending well forward over the tegumen. Gnathos a moderately stout hook with a few small teeth on the posteroventral edge. Aedeagus rather atypical with a peculiar slender extension from right side near middle (see Figs. 10–10b).

Female genitalia.—Normal for group except the signum has only one long curved, thornlike process instead of two.

Alar expanse, 15–18 mm.

Type.—U.S.N.M. no. 58258.

Type locality.—Presidio, Tex.

Food plant.—*Acacia vernicosa* Standl.

Remarks.—Described from the male type, one male and five female paratypes all from the type locality. All specimens bear the date 8-XI-1944 (emergence date ?) and were reared from larvae collected by J. H. Russell. Paratypes in the U. S. National Museum and the British Museum.

Filatima spinigera, n. sp.
Figs. 11–11b

Labial palpus creamy white; second segment narrowly pale fuscous exteriorly at base; third segment lightly and minutely irrorate with pale fuscous. Antenna fuscous. Head creamy white. Thorax and forewing sordid white to cinereous variously irrorate and marked with fuscous; costa, to apical third rather strongly, but narrowly, overlaid with fuscous; at apical third a poorly defined white spot is preceded by a small, fuscous blotch; around apex and along termen a row of indistinct, small fuscous spots is terminated, slightly before tornus, by an ill-defined, fuscous, outwardly oblique dash confluent with the discal spot at end of cell; in center of cell a small fuscous spot; both discal cell spots preceded and followed by light yellowish brown scales; cilia light yellowish fuscous irrorate with fuscous. Hind wing shining silvery white; cilia light yellowish fuscous; curtain scaling from underside of costa of male absent. Legs creamy white overlaid with fuscous. Abdomen sordid white lightly marked with fuscous beneath; anal tuft shining white.

Male genitalia.—Symmetrical. Dorsal lobe of harpe slender, short, tapering to a point and scarcely exceeding in length the thick fleshy ventral lobe. Aedeagus consisting of four stout, thornlike processes arising from a common base. Gnathos a short stout hook.

Alar expanse, 20–22 mm.

Type.—U.S.N.M. no. 58247.

Type locality.—Mojave Desert, near Llano, Calif.

Remarks.—Described from the male type and seven male paratypes from California as follows: Three paratypes from the type locality (4-IV-1938, Dr. John A. Comstock); one, La Puerta Valley (March 1); one, Dixieland, Imperial County (March 1–15, 1922, O. C. Poling); one, Essex (12-IV-1938) and one, Riverside (8-III-1934). The last two were collected by Grace H. and John L. Sperry.

Paratypes in the U. S. National Museum, the Los Angeles Museum, the British Museum, and in the collection of Grace H. and John L. Sperry, Riverside, Calif.

In the species group of the genus, to which *spinigera* belongs, are two other species, namely, *F. natalis* (Heinrich) and *F. inquilinella* (Busck). *F. spinigera* is nearest to *natalis* but can be distinguished from it by the short slender dorsal lobe of the harpe.

Filatima obidenna, n. sp.
Figs. 7–7b, 18

Labial palpus chalky white with blackish fuscous in the brush and completely overlaid with the same color exteriorly; third segment profusely irrorate with blackish fuscous. Head and thorax cinereous, the scales tipped with fuscous; face sordid white. Ground color of forewing dark fuscous; costal fourth of wing, from base to apical fourth, white with fuscous irrorations; extreme base of costa and two or three small spots within the white area near base, black; at basal fifth and middle the white costal color projects obliquely and transversely as incomplete fasciae to or slightly beyond fold; at apical fourth the white color extends across the wing totornus as an ill-defined transverse fascia; along the inner margin of the white costal area is irregular longitudinal olivaceous scaling; cilia pale fuscous with fuscous irrorations. Hind wing pale shining grayish fuscous basally shading to fuscous apically; cilia pale fuscous, darker apically; curtain scaling from underside of costa absent. Legs creamy white overlaid and banded with fuscous. Abdomen with first three segments yellowish above, remainder sor-

did whitish somewhat infuscated; beneath fuscous with a narrow irregular white central area.

Male genitalia.—Almost symmetrical. Ventral lobes of both harpes greatly reduced, dorsal members slender, pointed. Gnathos a long, slender curved process. Uncus slender, divided apically. Aedeagus with strongly sclerotized, spinous processes on the left side, and one thornlike process on the right side.

Female genitalia.—Signum with a single long dentate process.

Alar expanse, 17–20 mm.

Type.—U.S.N.M. no. 58252.

Type locality.—Paradise, Cochise County, Ariz.

Remarks.—Described from the male type, three male and four female paratypes from Arizona as follows: Paradise, Cochise County, four males, two females (April 1–7; no year or collector); Redington, two females (no further data). Paratypes in the U. S. National Museum and the British Museum.

Of the species described in this paper *obidenna* is nearest to *virgea*, but is probably more nearly related to *albicostella* Clarke.

Fascista bimaculella (Chambers), n. comb.

Gelechia bimaculella Chambers, Can. Ent. **4**: 108. 1872.
Gelechia (? *Lita*) *ternariella* Zeller, Verh. zool.-bot. Ges. Wien **23**: 264. 1873.
Gelechia sylvaecolella Chambers, U. S. Geol. Geogr. Surv. Terr. Bull. **4**: 86. 1878.
Filatima bimaculella (Chambers) Busck, Proc. U. S. Nat. Mus. **86**: 576. 1939.

Busck referred this species to *Filatima*, but a study of the genitalia reveals that *bimaculella* should be assigned to *Fascista*.

ICHTHYOLOGY.—*American species and subspecies of* Bathygobius, *with a demonstration of a suggested modified system of nomenclature.*[1] ISAAC GINSBURG, U. S. Fish and Wildlife Service. (Communicated by ELMER HIGGINS.)

The chief aim of this paper is to characterize briefly the American species and subspecies of fishes belonging to the genus *Bathygobius* and formally establish the names for these categories. The conclusions here epitomized are based on a detailed study of samples of the American populations[2] comprising, in the aggregate, over 800 specimens. The data have been tabulated, and of the characters studied the main ones of those that have proved pertinent to a taxonomic division of the populations are here employed. Some of the most important characters here used were, either altogether or partly, not taken into account by previous authors. Characters determined in this study which proved to be of secondary importance, and size and sex differences in proportional measurements (which are sometimes considerable), are generally omitted in this preliminary, condensed account. The populations of *Bathygobius* are here classified in accordance with what seems to be the proper interpretation of the totality of my voluminous data. The names of the taxonomic categories here established will prove to be of much help in the further study of the populations, by the proper labeling of the considerable amount of permanently preserved museum material that has been studied, and their use in discussion and correspondence.

Bathygobius is in an early stage of speciation at the present time level. The divergence of the species is of a low degree of magnitude in general. The divergence of some of the closely related and immediately contrasting populations is near the borderline between species and subspecies, and they may be designated either as full species or as subspecies, depending on a subjective estimate made by a given author. Furthermore, the species and subspecies are more or less heterogeneous, sometimes markedly so. Every minor local population shows its distinctive frequency distribution in one or more characters. The divergences of the local populations are of different degrees of magnitude and it is difficult to draw a line between the subspecies and the next lower categories. As a consequence, the proper

[1] Received February 14, 1947.
[2] The term "population" is used throughout this paper in the sense previously defined by me (Copeia 1937 (3): 185). That is, it is a general convenient term used to cover any natural group of individuals of species rank or lower.

taxonomic treatment of *Bathygobius*, the distinction of the populations and their division into species and the minor intraspecific categories, is difficult. On the other hand, an intensive study of progressive stages in the differentiation and ramification of natural populations, which *Bathygobius* affords, from the almost initial to moderately advanced stages, should be of help in throwing light on the species problem and in the speculative contemplation of evolution, more so than the study of speciation in genera in which the species are easily distinguishable.

Bathygobius does not differ from other genera of gobies in showing any special kind of speciation. In other genera, also, it is often found that a section containing two or more species is in an early stage of speciation, and such species, like the species of *Bathygobius*, are difficult to distinguish. *Bathygobius* is exceptional in that all the species, at least the American species, are in an early stage of speciation.

The taxonomic treatment of *Bathygobius* hitherto presented by authors is inadequate, evidently because of the state of speciation existing in this genus and the difficulty of distinguishing the species. The usual descriptive methods used in taxonomic routine are of but little avail for an understanding of the state of speciation in *Bathygobius*. A proper study of variability, by the determination and constructive marshaling of mass numerical data, is indispensable.

There is no general agreement among taxonomists in the treatment of the genus. Without going into a detailed review of the literature, I may state that recently most authors recognize two species on the Atlantic and Pacific coasts of North and South America, including the West Indies, namely, one species, *curaçao*, confined to the western Atlantic and comparatively not common, and another species, *soporator*, common to abundant, and widely distributed on the Atlantic and Pacific coasts. However, *curaçao* is not recognized by all authors. Furthermore, some authors treat the common American populations which are designated *soporator* by most other authors, as belonging to one supposedly circumglobal species, *Bathygobius fuscus*. My detailed study of the genus shows that existing published ideas regarding species distinction in *Bathygobius* are either untenable or represent only a small part of the story, as the following pages will unfold.

As a result of this study four names that have generally been placed in the synonymy because the original authors failed to elaborate the real distinguishing characters of their species, namely, *arundelii*, *catulus*, *lineatus*, and *andrei*, are resurrected and applied to their respective populations.

In this preliminary paper it is possible to give only a very sketchy, skeletonized outline of the richness and diversity of differentiation among the American populations of *Bathygobius*. Moreover, a complete study of the genus should include also the numerous populations from Oceania, the eastern Atlantic, the Red Sea, etc. But samples of these extralimital populations are not well represented in American museums.

The given length of specimens refers to the total length, including the caudal fin. Figures for measurements refer to percentages of the standard length. They are abstracted from my manuscript tables and are given to the nearest whole or half number as in those tables. Except as otherwise indicated, measurements, including the mode where stated, are based on the combined data, irrespective of size and sex. When the measurements are segregated by size and sex (as in the manuscript tables), the averages, the ranges or the modes differ by these groupings in most cases; but these details are omitted for the present.

Incidental to the chief aim, as stated above, a secondary object of this paper is to demonstrate the use of a modification in the conventional system of zoological nomenclature, for species and their subdivisions, where such subdivision is taken cognizance of by the formal establishment of scientific names. This modification has been proposed by me in a previous publication (Zoologica 23: 282–284. 1938). The present paper demonstrates how the proposed modification works in actual practice. The main headings for the subspecies are trinomials in compliance with the international code. The proposed modification is used as subheadings and in the discussions.

Discontent with the conventional system of nomenclature, or widespread current usage, especially for categories below that of species, has been evinced by biologists. This discontent rests on a more fundamental basis than the mere desire for change. Ideas referring to the basic species concept have been undergoing developmental changes, which have been especially rapid in recent years. The inevitable next step then, in discussing species, was to seek for a modification in zoological nomenclature which, in part, constitutes the language that expresses our ideas of the species concept. That is to say, there is a desire for a change in language in order to express more nearly our changed ideas.

Another cause of dissatisfaction is the use of quadrinomials, which in itself is a modification or extension of the existing international code. Quadrinomials smack too much of the pre-Linnaean polynomial system, in form though not in theory. Moreover, natural populations of species rank and lower, form, in miniature, a hierarchy of categories with a gradually decreasing magnitude of divergence, and there is no inherent reason to stop at quadrinomials. Some authors might propose to use quinquenomials or even sexinomials.

Still another urge for change is motivated by the desire for simplicity in nomenclature.

It is not my aim to give a comprehensive review and discussion of the various proposals that have been made for the modification of zoological nomenclature. A view that seems to have a considerable number of adherents has been expressed by Professor Needham (Science **71**: 26–28. 1930), namely, that if a population has reached a sufficient degree of divergence, as compared with immediately related populations, to be worth naming at all a binomial designation is enough. Reference to this proposition is also made by Professor Cole (Science **93**: 317. 1941). According to this view a name is primarily a handle, a convenient tool for its use in research and discussion of a given entity, which, after all, is the chief function of a name. As a tool, simplicity in nomenclature is desirable.

An argument often introduced for the use of trinomials and quadrinomials is that they also show relationship. However, it is not the function of nomenclature to show relationship. The system of nomenclature now in use does not show relationship at the species level and above (except in showing the generic affiliation of the species); it is not possible to devise a simple system that will do so. Moreover, the indication of relationship by a trinomial is limited; it does not show the relationship of the subspecies, of any one species, to one another. This argument also is not altogether applicable to borderline populations. A given borderline population may be treated by one author as a subspecies with the use of a trinomial and an indication, in a limited way, of relationship; while another author may treat the same population as a full species with the use of a binomial and no indication of relationship. Yet both hypothetical authors treat of the same entity. (It is safe to predict that the number of borderline cases will increase as taxonomists determine more and more the variability and morphologic ranges of the species they now recognize.) Also, suppose two of the intraspecific populations of a given species are near the borderline between subspecies and the next lower category (which I proposed to call "race" in the 1938 paper cited above). One author then may treat them as subspecies and use a trinomial without an indication of their near relationship, as compared with the other coordinate subspecies; while another author may treat them as races and use quadrinomials which would show their close relationship. (Theoretically, the same reasoning applies to quadrinomials and the next lower step in the hierarchy.) Finally, ideas of relationship change with increased knowledge, while nomenclature, to fulfill efficiently its chief function as a tool, should be fixed. To tie up nomenclature with ideas of relationship current for a time, as it is done by the use of trinomials, will lead, perhaps often, to changes of combinations of names.

The modification proposed by me and here demonstrated constitutes a sort of a synthesis of the method in current use and the view stated above which holds that all names should be binomial. The names used in my modification are universally binomial,

and when a species is formally split up into subspecies, a numeral subscript is added to indicate the taxonomic category of the population named. It is reasonable to expect that some changes in the prevailing system of zoological nomenclature will be gradually evolved and generally adopted some day. My suggested modification is here introduced, because *Bathygobius* constitutes a favorable example to demonstrate it. The suggested modification is presented for the consideration of biologists and to obtain their reaction. Perhaps it will form a basis for discussion. It is hoped that at least it will be found useful as supplementary to the conventional system for the sake of brevity in discussion.

Bathygobius curaçao (Metzlaar), **sensu lato**
Bathygobius curaçao$_1$ (Metzlaar)

Scales 31–36, present or absent on side of head. Pectoral rays usually 16–17, infrequently 15 or 18; upper 3 or 4 rays modified, their branching very sparse, nearly always forking once. Maxillary 11.5–13.5.

This species is synpatric[2] with *soporator$_1$* (except *catulus$_3$*) and *mystacium*. It differs from *soporator$_1$* chiefly in having a smaller number of scales and pectoral rays and fewer modified rays. From *mystacium* it differs mainly in having fewer pectoral rays and a longer maxillary. The samples examined by me are divisible into two subspecies as follows:

Bathygobius curaçao lepidopoma, n. subsp.
Bathygobius lepidopoma$_2$, n. subsp.

Opercle with a patch of 1–8 scales at upper anterior corner; a patch of scales on cheek in the majority of specimens (in about two-thirds). Pectoral 23–26.

[2] This apt term, effectively used by Mayr in a recent book, *Taxonomy and the origin of species*, which treats mainly of some aspects of tendencies and trends in ornithologic taxonomy, should prove useful for brevity and in clarifying taxonomic discussions in general, and deserves a wider application. Two populations are synpatric when their geographic ranges coincide or overlap; they are allopatric when they occupy separate territories. It so happens that closely related populations of a lower rank than full species are, as a rule, allopatric. This is a universal fact of biology and applies to fishes as well as to birds and other groups. Bearing this in mind should help to preclude fallacious interpretation of taxonomic data in ichthyology as well.

Holotype: U.S.N.M. no. 57452. Newfound Bay, Fla.; male 55 mm.

A composite sample of 10 other specimens 31–55 mm examined from Newfound Harbor, Broad Creek, Boca Chica, and Key West; all localities in southern Florida.

This subspecies differs from *curaçao$_2$* chiefly in the scalation on the side of the head. They differ in a lesser degree in some proportional measurements. Typical specimens have a distinctive physiognomy. On the whole, the difference between *curaçao$_2$* and *lepidopoma$_2$* is greater than the usual difference between two coordinate subspecies. It is rather near the borderline between species and subspecies, and it would not be far fetched to treat them as two allopatric species. *B. lepidopoma$_2$* evidently has a very restricted distribution, being confined to Key West and the very closely adjacent keys where it replaces *curaçao$_2$*. Samples from Tortugas agree more nearly with *curaçao$_2$* from the West Indies and Panama and are grouped with that subspecies.

Bathygobius curaçao curaçao (Metzlaar)
Bathygobius curaçao$_2$ (Metzlaar)

Gobius curaçao Metzlaar, Rap. Vissch. Kolonie Curaçao, edit. by J. Boeke, **2**: 136. 1919 (Curaçao; Bonaire).

Opercle usually without scales, variants sometimes having one or two scales; infrequently 2–3 scales on cheek. Pectoral 25–28.

A composite sample of 25 specimens 23–62 mm examined from Tortugas, Florida; Bermuda; Haiti; St. Thomas, Virgin Islands; Curaçao; Colon and Porto Bello, Panama.

Bathygobius mystacium, n. sp.

Scales 34–36, none on side of head. Pectoral rays 19–20; upper 4 or 5 modified, their branching sparse, usually forking once. Maxillary 9.5–11.5.

Holotype: U.S.N.M. no. 119895. Nassau, Bahamas; male 57 mm.

A composite sample of 8 other specimens 31–57 mm examined from Nassau, Bahamas; Cuba; Old Providence Island; Colon, Panama.

This species is synpatric with *curaçao$_2$*, *soporator$_2$*, and *longiceps$_2$*. Some specimens were found mixed in the same containers with *soporator$_2$*, and they evidently occur together. It differs from *soporator$_1$* in having fewer scales and from *curaçao$_1$* in having more pectoral

rays. It differs from both in having a shorter maxillary. It intergrades slightly with *curaçao*$_1$ in the latter character, but not with *soporator*$_1$ when the data are segregated by size.

Bathygobius arundelii (Garman)

Gobius arundelii Garman, Proc. New England Zool. Club 1: 63. 1899 (Clipperton Island).

Scales 37; present on opercle in a small patch; a few also present on cheek. Pectoral rays 19 (probably only upper 3 modified and forking only once, the fin partly broken in the single specimen examined). Caudal 34 (the combined range of several hundred specimens of all other American species 23–33).

Only the type specimen of this species was examined. It is difficult to discuss the relationship of any one species of *Bathygobius* on the basis of a single specimen, because all the species are so near one another morphologically. For instance, the scale count of this specimen is at the borderline of the separation of two groups of species, and to have an adequate picture of the position of *arundelii* it is necessary to determine the frequency distribution of its scale count. However, after determining the morphological ranges of the other species on the basis of more or less adequate samples, it becomes clear that the single type specimen represents a species, *arundelii*, which is different than all other American species. It differs from *mystacium*, *soporator*$_1$, *ramosus*$_1$, and *lineatus*$_1$ in having scales on the side of the head. It differs from *curaçao*$_1$ in having more, and from *andrei*$_1$ in having fewer pectoral rays. It apparently differs further from *andrei*$_1$ in having fewer modified rays. It seems to differ from all American species in having a longer caudal. It is quite likely an insular species confined to Clipperton Island.

Bathygobius soporator (Cuvier and Valenciennes), **sensu lato**

Bathygobius soporator$_1$ (Cuvier and Valenciennes)

Scales 37–42, absent on side of head. Pectoral rays 17–22; upper 4–6 rays modified, their extent of branching moderate, the upper three usually forking but once. Ventral (measurement of longest rays from their point of articulation) 20–26 in 91 per cent of specimens, lower limit of range 18. Posterior dorsal rays of large male prolonged, reaching end of hypural or a little beyond. Color pattern very variable and its norm differing also with the local population; a rather diffuse, incomplete and irregular cross-banded pattern; or superimposed on cross-banded pattern, partly or almost wholly replacing it, a 2-rowed spotted pattern on lower half of body, two longitudinal rows of spots, one row of about 9 spots running full length of body directly below the midline, and a shorter row under anterior part of upper row. Maxillary 11.5–16.5.

This species is nearest morphologically to *mystacium*, *lineatus*$_1$, and *ramosus*$_1$ and the differences between *soporator*$_1$ and those three species are discussed briefly under their accounts.

This species is markedly heterogeneous. Moreover, morphologic divergence of the different populations is correlated with geographic distribution only in a very general way; the two do not always coincide. Hence, it is difficult to draw a line between the subspecies and the next lower category or race. On the basis of the samples examined, considering morphology as the primary and geography as a secondary factor in reaching conclusions, the species is divided into four subspecies. As here constituted, *catulus*$_2$ and *soporator*$_2$ are more heterogeneous than the other two, *soporator*$_2$ especially so. Some of the populations grouped under *soporator*$_2$, perhaps also some placed under *catulus*$_2$, might be raised to subspecies rank after a study of more extensive samples.

Bathygobius soporator catulus (Girard)

Bathygobius catulus$_2$ (Girard)

Gobius catulus Girard, Proc. Acad. Nat. Sci. Philadelphia 1858: 169 (St. Joseph Island, Tex.).

Head modally 31, varying 29–33. Caudal 25–28 in 90 per cent of specimens, varying 24–30. Eye 6.5–8.0 in specimen 61–80 mm. Postorbital 15–18. Pectoral rays 17–20; the number of modified rays usually 4. Color pattern of the cross-banded phase; on lower half of body pigment sometimes diffusely separated, presenting a rather faint suggestion of the two-rowed spotted pattern, especially in small specimens.

A composite sample of 70 specimens 20–126 mm, examined from the East and Gulf coasts of the United States ranging from Pilot Town to New Smyrna, Fla., and from Indian Key (at Ten Thousand Islands), Fla., to Corpus Christi Pass, Tex. A small composite sample from the southernmost Florida Keys is tentatively included below under *soporator*$_2$.

This subspecies is characterized by averaging a short caudal, small eye and a low pectoral count, besides other differences, as compared with the other populations of *soporator*$_1$.

Bathygobius soporator soporator (Cuvier and Valenciennes)
Bathygobius soporator$_2$ (Cuvier and Valenciennes)

Gobius soporator Cuvier and Valenciennes, Hist. Nat. Poiss. 12: 56. 1837 (Martinique; Cuba).

Head usually 30–32, varying 28–34. Caudal 26–30 in 90 per cent of specimens, varying 25–33. Eye 6.5–9.5 in specimens 61–80 mm. Postorbital 15–18. Antedorsal 34–42. Maxillary modally 13.5 or 14.5, depending on the population. Pectoral rays 18–21 with the mode at 19 or 20 depending on the population; number of modified rays usually 5; fourth modified ray (from top) forking more than once in about 50 per cent of specimens of most populations. The 2-rowed, spotted pattern rather well-defined in most populations; while in some others the cross-banded or an intermediate pattern is common.

A composite sample of 200 specimens 14–122 mm examined. Composite samples of 12 specimens or more were examined from the Bahamas, Cuba, Santo Domingo, Puerto Rico and Brazil. Smaller samples examined from Martinique (one of the type localities) and Cozumel Island, Mexico, are grouped with this subspecies. Samples of 1–6 specimens examined from localities in between those mentioned are also included, except a large sample from Panama, which is next described as a distinct subspecies. A small composite sample of 16 specimens 39–112 mm from the southernmost Florida Keys, namely, Lower Matecumbe Key, Key West, and Tortugas, is not decisive, but is perhaps slightly nearer *soporator*$_2$ than *catulus*$_2$ and is tentatively grouped with this subspecies.

Bathygobius soporator longiceps, n. subsp.
Bathygobius longiceps$_2$, n. subsp.

Head modally 32, varying 29–34. Caudal 26–29 in 90 per cent of specimens, varying 25–30. Eye 7–9 in specimens 61–80 mm. Postorbital 15–20. Antedorsal 36–43. Maxillary modally 14.5. Pectoral rays 18–21 with the mode at 19; the number of modified rays usually 5; the fourth modified ray forking once in about 80 per cent of specimens. Color pattern variable; cross-banded, two-row spotted, or intermediate.

Holotype: U.S.N.M. no. 119896. Porto Bello, Panama; male 108 mm.

A composite sample of 90 other specimens 17–88 mm examined from various localities on the Atlantic coast of Panama and the Canal Zone.

The Panama population is separated as a distinct subspecies from the other populations of *soporator*$_2$ largely on the basis of a combination of characters. It has a comparatively long head, postorbital, antedorsal and maxillary, a comparatively low pectoral count and sparse extent of branching of the modified pectoral rays. These characters are nearly duplicated in one or another of the populations of the heterogeneous *soporator*$_2$; but in the Panama population they occur together, and for this reason it is deemed appropriate to set it aside as a distinct subspecies, *longiceps*$_2$.

Bathygobius sporator sextaneus, n. subsp.
Bathygobius sextaneus$_2$, n. subsp.

Head 28–32. Caudal 26–32. Eye 7–9 in specimens 65–80 mm. Postorbital 14–16. Antedorsal 35–38. Maxillary 12.5–14.5. Pectoral rays 19–22 with the mode at 20; the number of modified rays usually 6. Two-rowed, spotted color pattern usually rather well defined.

Holotype: U.S.N.M. no. 21231. Bermuda; female 103 mm.

A composite sample of 18 other specimens 44–113 mm examined from Bermuda.

This subspecies differs from the others in usually having 6 modified rays and averaging a higher pectoral count. The sixth ray of *sextaneus*$_2$ resembles in structure the fifth ray (or the fourth) of the other subspecies. The postorbital part of the head especially, and also the head, antedorsal distance and maxillary are short.

Bathygobius lineatus (Jenyns), **sensu lato**
Bathygobius lineatus$_1$ (Jenyns)

Scales 38–42, none on side of head. Pectoral rays 19–22; usually upper 5 rays modified, their extent of branching rather sparse, the upper 3 usually forking once. Large male with the posterior dorsal rays not notably prolonged, not reaching end of hypural.

This species is divisible into two subspecies, *lineatus*$_2$ in the Galápagos Islands and *lupinus*$_2$

from Lobos de Afuera Island, off the coast of Peru.

B. lineatus$_1$ is another borderline population morphologically. It is very close to *soporator*$_1$, and its two subspecies might within reason be placed as subspecies of *soporator*$_1$. It differs from *soporator*$_1$ chiefly in the relative length of the posterior dorsal rays of the large male. But even this character is not pronounced, and moreover, it differs to a moderate extent also intraspecifically with the local populations. However, because of the absolute geographic separation of *lineatus*$_1$ and *soporator*$_1$ and for convenience, it is deemed best to treat them as two full species based on this one rather slight and variable difference. As the species of *Bathygobius*, in general, have not yet diverged to a high degree, this small difference perhaps takes on added significance.

Bathygobius lineatus lineatus (Jenyns)
Bathygobius lineatus$_2$ (Jenyns)

Gobius lineatus Jenyns, Zool. Voy. *Beagle* **4**: 95, pl. 19, fig. 2. 1842 (Galápagos).

Depth of caudal peduncle 11.5–14.5. Head 29–34. Postorbital 14–18. Antedorsal 35–41. Maxillary 12.5–15.5 in specimens 56–94 mm. Pectoral rays 19–22, with the mode at 20.

Of this subspecies 70 specimens 17–94 mm were examined from James, Chatham, Charles, Bartholomieu, and Narborough Islands. It is evidently an insular subspecies of the Galápagos Archipelago.

Bathygobius lineatus lupinus, n. subsp.
Bathygobius lupinus$_2$, n. subsp.

Depth of caudal peduncle 14.5–15.5. Head 29–30. Postorbital 14–15. Antedorsal 35–37. Maxillary 12.5–14.5 in specimens 66–123 mm. Pectoral rays 19–20.

Holotype: U.S.N.M. no. 77510. Lobos de Afuera, Peru; male 123 mm.

Two other males 66–85 mm examined from the same place.

This subspecies differs from *lineatus*$_2$ in averaging a deeper peduncle and a shorter head, postorbital, antedorsal and maxillary. It attains to a larger size. While ordinarily it is a risky business to establish a new subspecies on the basis of only 3 specimens, yet, after comparing the measurements of these specimens with the frequency distribution of *lineatus*$_2$, and other species and subspecies of *Bathygobius*, I am confident that an examination of an adequate sample from Peru will confirm the conclusion that that population is subspecifically distinct from that of the Galápagos.

Bathygobius ramosus, n. sp., **sensu lato**
Bathygobius ramosus$_1$, n. sp.

Scales 36–43, none on side of head. Pectoral rays 17–21; usually the upper 5 modified, profusely branched, the second and third (from top) usually forking twice or three times. Ventral 15–19 in 88 per cent of the specimens, the upper limit of the range 22. Usually a single longitudinal row of about 9 spots nearly median in position; the spots, or a variable number of them, usually partly or almost wholly split up into 2 or 3 parts, presenting gross appearance of a series of more numerous and smaller spots than in *soporator*$_1$; cross-banded pattern absent or present on upper half of side only.

This is the commonest and most widespread species of *Bathygobius* on the Pacific coast of the American continents. All authors combined *ramosus*$_1$ with the common Atlantic *soporator*$_1$ under one heading. However, *ramosus*$_1$ differs from *soporator*$_1$ in having a shorter ventral, the modified pectoral rays branch more profusely and the color pattern is usually distinctive. Having examined in detail over 600 specimens of both species, I can safely make the statement that after one becomes familiar with their distinguishing characters and then attempts to identify single specimens, from the opposite coasts of Panama, without a knowledge of the locality of capture, he should make a correct identification in 95 or more trials out of 100. The large majority of specimens of *ramosus*$_1$ may be placed at a glance by distinctive color alone. This is about as good or better than is possible to do with many other closely related species which are generally recognized by authors.

The extent of branching of the modified pectoral rays varies greatly with the individual and each ray varies independently and in this preliminary paper the statements in the diagnoses of the two species give only a part of the picture of this difference.

The samples examined of *ramosus*$_1$ indicate that it is divisible in at least 4 subspecies, as follows:

Bathygobius ramosus curticeps, n. subsp.
Bathygobius curticeps$_2$, n. subsp.

Pectoral rays modally 20, varying 19–21.

Scales modally 39, varying 38–42 (infrequently 42). Head usually 29–30, varying 28–32. Caudal 25–31. Eye 7.5–9.0 in specimens 46–60 mm.

Holotype: U.S.N.M. no. 30739. Cape San Lucas, Mexico; male 98 mm.

A composite sample of 50 other specimens 23–92 mm examined from Cape San Lucas, Mazatlán, and Tres Marías Islands, all localities on the Pacific coast of Mexico. A small composite sample of 16 specimens 19–86 mm from Ecuador and Colombia agrees most nearly with *curticeps*$_2$ and is tentatively grouped with it.

This subspecies differs from *ramosus*$_2$ chiefly in having a shorter head and also in having a shorter postorbital, antedorsal and maxillary, and a somewhat less profuse branching of the modified pectoral rays.

Bathygobius ramosus ramosus, n. subsp.
Bathygobius ramosus$_2$, n. subsp.

Pectoral rays modally 20, varying 18–21 (infrequently 18). Scales modally 39, nearly always 37–41, rarely 36 or 42. Head usually 31–32, varying 29–33. Caudal 24–30. Eye 7.0–10.0 in specimens 46–60 mm.

Holotype: U.S.N.M. no. 119897. Balboa, Panama; male 87 mm.

A composite sample of 150 other specimens 21–101 mm examined in detail from various localities on the Pacific coast of Panama and the Canal Zone.

This subspecies is probably nearest *curticeps*$_2$ and their differences are stated above.

Bathygobius ramosus micromma, n. subsp.
Bathygobius micromma$_2$, n. subsp.

Pectoral rays usually 20, often 19. Scales 40–43. Head modally 29, varying 28–30. Caudal 26–28. Eye 6.5–7.5 in specimens 50–60 mm.

Holotype: U.S.N.M. no. 53504. Paita, Peru; male 61 mm.

Other 10 specimens 50–72 mm from same locality examined.

This subspecies averages the smallest eye and the highest scale count as compared with all other three subspecies. The head length is nearest to that of *curticeps*$_2$ (averaging somewhat shorter than in that subspecies even), and on the whole, it is nearest morphologically to *curticeps*$_2$.

Bathygobius ramosus longipinnis, n. subsp.
Bathygobius longipinnis$_2$, n. subsp.

Pectoral rays modally 19, varying 17–20. Scales 38–41. Head modally 30, varying 28–32. Caudal 27–33. Eye 7.5–9.5 in specimens 46–56 mm.

Holotype: U.S.N.M. no. 119898. Socorro Island, Revillagigedo Archipelago; male 78 mm.

A composite sample of 25 other specimens 15–90 mm examined from same island.

This is evidently an insular subspecies inhabiting Socorro Island (perhaps also the other islands in the Revillagigedo Archipelago). It differs from the other three subspecies in having a lower pectoral count and a longer caudal. The other fins also average somewhat longer but the divergence is not as marked. On the whole, *longipinnis*$_2$ diverges from the three mainland species to a greater extent than the latter diverge from one another. Its divergence is not far from the borderline of species and subspecies.

Bathygobius andrei (Sauvage), **sensu lato**
Bathygobius andrei$_1$ (Sauvage)

Scales 37–42, present or absent on side of head. Pectoral rays usually 21–22, varying 20–23; usually upper 5 rays modified, moderately branched, the upper three usually forking once. An incomplete and diffuse cross-banded color pattern.

This species is divisible into two synpatric subspecies, the distributional basis of their separation probably being water depth as indicated below, that is, they are apparently two synpatric ecological subspecies.

One subspecies, *andrei*$_2$, is readily separated from *ramosus*$_1$, *soporator*$_1$, and *lineatus*$_1$ by having scales on the side of the head; but this does not always hold for the other subspecies. This species is further separable from *ramosus*$_1$, with which it is synpatric, by the extent of branching of the modified pectoral rays and the color pattern. The frequency distribution of the pectoral count is decidedly different in *andrei*$_1$ than in all other American species, but there is some overlapping in that character.

There is a shade of doubt in my mind whether the name *andrei*, which has been generally relegated to the synonymy, is properly applicable to the species here distinguished. Sauvage's original description is largely generic.

Moreover, that author states "tête entièrement nue," which does not apply to the main character that distinguishes our *andrei*$_2$. My reliance for the present use of the name *andrei* is based on the locality (Ecuador) and size (160 mm) given in the original description. According to my rather extensive samples that size is applicable only to that American population here designated *andrei*$_2$. I assume that Sauvage overlooked the patch of scales on the opercle.

Bathygobius andrei andrei (Sauvage)
Bathygobius andrei$_2$ (Sauvage)

Gobius andrei Sauvage, Bull. Soc. Philomatique (7) 4: 44. 1880 (Guayas, Ecuador; in brackish water).

Scales 37–41; a rather large or moderate patch of scales on opercle; scales on cheek present or absent. Pectoral 22–29. Caudal 25–32. Head 30–35. Depth of peduncle 12.5–15.5.

A composite sample of 45 specimens 21–198 mm examined from the Pacific coast, ranging from Barranca, Costa Rica, to Guayaquil, Ecuador, and including Panama.

This is apparently a typical tide-pool population. It occurs together with *ramosus*$_2$ and some of the constituent samples examined were separated from containers which included a mixture of both that is readily separable into their proper species. *B. andrei*$_2$ constitutes a morphologically compact population rather easily separable (in a comparative way) from all American species and subspecies of *Bathygobius*, except *heteropoma*$_2$. The latter introduces a rather discordant element in the easy and orderly taxonomic placement of *andrei*$_2$. The proper distinction of *andrei*$_2$ from the other species is discussed above under *andrei*$_1$, and from *heteropoma*$_2$ under that subspecies below.

Bathygobius andrei heteropoma, n. subsp.
Bathygobius heteropoma$_2$, n. subsp.

Scales 40–42; absent on side of head, or when present, varying from a single scale to a small patch on opercle (smaller than in *andrei*$_2$). Pectoral 20–23. Caudal 23–28. Head 30–32. Depth of peduncle 14.5–15.5.

Holotype: U.S.N.M. no. 119894. Chame Point, Panama; male 101 mm; Robert Tweedlie.

A composite sample of 8 other specimens 47–115 mm examined from the same locality by the same collector.

Robert Tweedlie's collecting methods have been described by Meek and Hildebrand (Publ. Field Mus. Nat. Hist. 15 (1): 6. 1923), and it seems very probable that the specimens examined belong to a population that lives at a moderate distance offshore, while *andrei*$_2$ is a typical shore and tide-pool subspecies.

This subspecies differs from *andrei*$_2$ in lacking scales on side of the head, or when present they are in sparser numbers. (One is tempted to say that *heteropoma*$_2$ is on the way to losing the scalation on the side of the head because of its changed habitat.) The frequency distribution of the scale count will perhaps prove to differ in the two subspecies on further sampling. The caudal, head, postorbital, and antedorsal of *heteropoma*$_2$ seem to average shorter and the peduncle deeper than in *andrei*$_2$. The pectoral averages considerably shorter in *heteropoma*$_2$ than in *andrei*$_2$ and all other American species and subspecies of *Bathygobius*. Considering all differences, it may perhaps be stated that *heteropoma*$_2$ is not far from the borderline between species and subspecies.

KEY TO THE AMERICAN SPECIES AND SUBSPECIES OF *BATHYGOBIUS*[4]

a. Scales 31–36. Western Atlantic.
b. Pectoral rays 15–18 ..... *curaçao*$_1$
c. A patch of scales present on opercle. Key West and very closely adjacent keys .... *lepidopoma*$_2$
cc. Scales usually absent on opercle. Tortugas, Florida; West Indies; Panama ..... *curaçao*$_2$
bb. Pectoral rays 19–20. West Indies; Panama ..... *mystacium*
aa. Scales 36–43.
d. Pectoral rays 17–22, the mode at 18, 19, and 20, depending on the population.
e. Scales present on side of head; caudal 34. Clipperton Island ..... *arundelii*
ee. Scales absent on side of head; caudal 23–33.
f. Upper three modified pectoral rays usually forking once; ventral 18–26.
g. Posterior dorsal rays of large male more or less prolonged, reaching end of hypural or a little beyond. Western Atlantic ..... *soporator*$_1$
h. Modified pectoral rays usually 4 or 5.

[4] Footnote 4 at end of key (p. 284).

i. Caudal short and eye small. Florida to Texas, except southernmost Florida Keys. *catulus*,

ii. Caudal longer and eye larger.

j. Head, postorbital, antedorsal, and maxillary long; pectoral count comparatively low; branching of modified rays sparse. Panama. *longiceps*,

jj. Characters differing with the local population, but not occurring in preceding combination. Southernmost Florida keys to Brazil and the West Indies, excepting Panama. *soporator*,

hh. Modified pectoral rays usually 6. Bermuda. *sextaneus*,

gg. Posterior dorsal rays of large male not markedly prolonged, not reaching end of hypural. Eastern Pacific. *lineatus*,

k. Depth of caudal peduncle 11.5–14.5; maximum length 94 mm. Galápagos Archipelago. *lineatus*,

kk. Depth of caudal peduncle 14.5–15.5; maximum length 123 mm. Lobos de Afuera Island, Peru. *lupinus*,

ff. Second and third modified pectoral rays usually forking more than once; ventral 15–22. Eastern Pacific. *ramosus*,

l. Pectoral rays modally 20.

m. Eye not small; scales 36–42.

n. Head usually 29–30. Coasts of Mexico, Colombia, and Ecuador. *curticeps*,

nn. Head usually 31–32. Panama. *ramosus*,

mm. Eye small; scales 40–43. Paita, Peru. *micromma*,

ll. Pectoral rays modally 19. Socorro Island. *longipinnis*,

dd. Pectoral rays usually 21–22, varying 20–23. Eastern Pacific. *andrei*,

o. Scales on opercle in a rather large or medium sized patch; pectoral 22–29. Costa Rica to Ecuador, including Panama, inshore. *andrei*,

oo. Scales on opercle in a small patch or absent; pectoral 20–23. Panama, offshore. *heteropoma*,

[4] I present this key here, in conjunction with the present short résumé, with some measure of reluctance, rather in deference to the opinion of many taxonomists who seem to regard a key as indispensable. In general, a key is, of course, a useful tool in taxonomic practice, when based on carefully tested data instead of being merely compiled from the literature. Even so, there are many exceptions, where the brief and categorical statements used in a key, without numerous qualifying phrases, and without reference to the full data in the text on which conclusions are based, may be somewhat misleading, and *Bathygobius* is such an exception. In such cases the key best finds its place in a publication presenting the full details of the study, reenforced by tables, instead of in a short, condensed, skeletonized, preliminary paper, such as this one. While this key gives a bird's-eye general view of the characters that separate, and the relationship between, the species and subspecies, the student should not assume that it constitutes an easy shortcut to enable him always to "run down" specimens correctly.

ZOOLOGY.—*Notes on some Mexican urocoptid mollusks, with the description of new species.*[1] PAUL BARTSCH, U. S. National Museum.

The U. S. National Museum recently received several sendings of mollusks from Mexico from that indefatigable collector, Miss Marie E. Bourgeois. Among other things these include fine lots of members belonging to the family Urocoptidae. Some of them have required considerable research to untangle the confused nomenclature, while others prove to belong to undescribed species. It is hoped that this little paper will prove helpful and stimulate our Mexican friends to further efforts in this field.

Genus **Anisospira** Strebel

Anisospira? martensii (Strebel)

1865. *Cylindrella* (*Urocoptis*) *truncata* von Martens, Malakoz. Blätt. 12: 13–14, in part.

1880. *Eucalodium martensi* Strebel, Beitr. Kenntn. Fauna Mex. Land- und Süsswasser Conch. 4: 73–74, in part; pl. 13, fig. 13; pl. 11, figs. 8, 14; pl. 12, fig. 3.

1897. *Eucalodium truncatum* von Martens, Biologia Centrali-Americana: 264, in part.

Shell decollated, turrited, solid, dusky olivaceous, somewhat paler at the suture; whorls remaining 7, scarcely convex, increasing regularly arcuately striate, with 3 or 4 slightly elevated, irregular spiral lines. Last whorl not solute, rounded, with an obsolete basal carina. Aperture subdiagonal, subcircular, posterior angle rounded, separated a little from the penultimate whorl. Columellar fold obsolete. Peristome somewhat thickened and slightly expanded. Length, 29.5 mm; diameter, 10 mm; aperture length, 7 mm; diameter, 6 mm.

[1] Received March 5, 1947.

The above is a translation of von Martens's Latin description of a specimen in the Berlin Museum collected by H. Uhde in Mexico. No specific locality was known for it.

Strebel (*loc. cit.*) redescribes this specimen as follows: The shell is solid and possesses the characters of *Eucalodium* as well as their form, coloration, and gloss. Its color is yellowish brown shading to paler and almost straw yellow in the suture. The sculpture consists of very inconspicuous, fine ribs, which are quite regularly but not closely spaced. In addition, one finds in places on the lower half of the whorls near the suture a short, irregular folding, which passes obliquely forward, and 2 to 4 fine, in places interrupted, weak, tumid, spiral lines, which are of the same strength and elevation as the axial ribs. It is difficult to say whether these features are individual or specific variations, but probably they are specific. The 7½ remaining whorls are well rounded, appressed at the summit, and slightly tumid at the suture, so that this appears slightly channeled. The last whorl in the beginning is weakly keeled below, then provided with a weak tumid area, which extends to the aperture. The specimen appears to be not quite adult, for the last portion seems to be on the point of becoming solute and the white peristome is only slightly expanded and not completely separated, although united by a columellar callus. The inside of the aperture is white with a faint violet tinge. The columella is simple, apparently hollow as in *Eucalodium* and twisted in each whorl about the axis. The columellar fold is slight and evenly placed. Height, 29.2 mm; diameter at tip, 6.4 mm; greatest diameter 9.8 mm; below 9.2 mm. Aperture height 7.7 mm; diameter, 6.5 mm.

This description is followed by a description of the dried soft parts, which von Martens found in the shell, which he figures on plate 11, figure 8 (radula), figure 14 (jaw), plate 12, figure 3 (reproductive system).

From Strebel's description I am led to believe that this shell belongs to the genus *Anisospira*.

Attempting to discover its possible home by tracing Uhde's peregrinations in Mexico, one finds the following information in Dr. Eduard von Martens's paper, "Ueber die mexikanischen Binnen Conchylien aus den Sammlungen von Deppe und Uhde in Berliner Museum."[1] Von Martens states that Uhde was a member of the Prussian Embassy staff in Mexico. Von Martens, under each species, lists the shells collected by Uhde. Many of these bear only "Mexico" as locality designation. A great number, however, give more specific locality data, showing that Uhde collected in the states of Veracruz, Puebla, Mexico, Oaxaca, and Michoacán. Since Oaxaca is the center of *Anisospira* distribution, it seems indicated that we should look for the home of this species in that state. Oaxaca is the home of *Anisospira dalli* von Martens, *liebmanni* Pfeiffer, *strebeli* Pfeiffer, *verdensis* Dall, and *orcutti* Dall. According to von Martens, Uhde collected "*Glandina turris* Pfeiffer" in Oaxaca near the west coast, at an elevation of 10,000 feet; also "*Helix bicincta* Pfeiffer" in the southern interior of Oaxaca and "*Bulimulus* (*Liostracus*) *mexicanus gracilior* Pfeiffer" in Oaxaca.

[1] Malakoz. Blätt. 12: 1–78. 1865.

Genus **Oligostylus** Dall

Oligostylus mariae, n. sp. Fig. 1

1892. *Eucalodium martensi* (Strebel) Pilsbry, Man. Conch. 15: 18–19, in part.

1897. *Eucalodium truncatum* (Pfeiffer) von Martens, Biologia Centrali-Americana: 256, 264, ?pl. 16, figs. 3–9.

Shell cylindroconic, chestnut-brown, with the peristome white with a brownish flush, interior of the aperture brownish. The early whorls are decollated. Even the young specimens bear the sculpture of the adult and have practically the same rotundity of the whorls. The adult shell has the whorls moderately rounded and separated by a well-impressed suture. They are crossed by numerous retractively slanting axial riblets, which are separated by spaces about as wide or a trifle wider than the riblets. Of these riblets, 96 are present on the last whorl, where they become more crowded immediately behind the peristome; 87 of them are present on the penultimate whorl. Periphery of the last whorl well rounded, with the merest indication of an angulation. Base short, well rounded, with a narrow umbilical chink and marked by the continuation of the axial ribs, which extend slightly enfeebled to the umbilical chink. The last whorl is slightly solute. Aperture broadly ovate, almost subcircular, and slightly oblique. Peristome slightly expanded, slightly reflected, and somewhat thickened. The columella shows an oblique fold deep within the aperture. The columella is

slender with the merest indication of a twist and without fold.

The type, U.S.N.M. no. 543582, was collected by Miss Bourgeois at Omiltemi, Guerrero. It has 7 whorls remaining and measures: Length, 26.3 mm; greatest diameter, 8.9 mm. U.S.N.M. no. 543583 and U.S.N.M. no. 543584 contain 21 young and adult topotypes from the same source. Five additional specimens have been returned to Miss Bourgeois. These bear the collector's numbers 990 and 991.

The species is probably most nearly related to *Eucalodium neglectum* Crosse and Fischer, described from Oaxaca, Mexico. This, however, is much larger with quite different sculpture.

Von Martens states, on page 264 under the much confused concept of *Eucalodium truncatum*, that he has received several specimens from H. H. Smith collected at "Omilteme," Guerrero, which enables him to give a new description and figure of it. Apparently there must have been an error in his citation, for his explanation of figures on plate 16, figures 3 to 9, are all credited to Angangueo (Michoacán). They were probably based on the Omiltemi specimens.

Oligostylus? hegewischi, n. name

1841. *Bulimus truncatus* Pfeiffer, Symb. Hist. Helic.: 43–44, not *Bulimus truncatus* Bruguière, Encycl. Method.: 319, 1792.
1843. *Bulimus truncatus* Pfeiffer, Philippi Abbild. Beschr. Conch.: 55, pl. 1, figs. 8a, b, c.
1848. *Bulimus truncatus* Pfeiffer, Monogr. Helic. Viv. **2**: 154.
1849. *Bulimus truncatus* Reeve, Conch. Icon.: pl. 70, fig. 498.
1865. *Cylindrella* (*Urocoptis*) *truncata* von Martens, Malakoz. Blätt. **12**: 13–14, in part.
1873. *Eucalodium truncatum* Fischer and Crosse, Miss. Scient. Mex., Mollusca, **1**: 392–394, in part.
1886. *Eucalodium martensii* Strebel, Beitr. Kenntn. Fauna Mex. Land- und Süsswasser Conch. **4**: 73–74, in part.
1897. *Eucalodium truncatum* von Martens, Biologia Centrali-Americana: 265, in part.
1902. *Eucalodium martensi* Pilsbry, Man. Conch. **15**: 18–19, in part.

Shell subcylindric, apex decollated, solid, epidermis greenish horn-colored, obliquely striate; suture impressed, pale; whorls 8, convex, the last angulated at base; aperture suborbicular, soiled white within; peristome almost simple, almost covering the slight umbilicus rimation with its expanded columellar edge. Length, 14 lines [30.5 mm]; diameter, 4½ lines [9.4 mm].

Near Angangueo, Michoacán, Mexico, collected by Hegewisch under leaves of American agaves.

The above is a translation of Pfeiffer's Latin description to which he adds, in Philippi, page 55, that he had in addition to the adult specimen, some young individuals one of which is also figured in c. He states here that the whole shell is quite regularly obliquely striated, brownish, tending toward olive-green, with every turn much paler toward the suture.

Pfeiffer states in a footnote in von Martens's paper (Malakoz. Blätt. **12**: 14) that he had to return to Hegewisch the adult specimen and that it is unknown what has become of this. All of which means that the proper systematic position of *Bulimus truncatus* Pfeiffer, which I am here rechristening *Oligostylus hegewischi*, will have to await the securing of specimens from the type locality.

It is to be hoped that Miss Bourgeois will rediscover it at Angangueo.

Genus **Coelocentrum** Crosse and Fischer

Coelocentrum huertai, n. sp.

Fig. 5

Shell cylindroconic, chestnut-brown (sometimes white), with the aperture brown or in the albinos white. The nuclear whorls are decollated in all our specimens. Young shells minus the extreme nuclear tip show that the shell increases quite regularly in size, but the outlines thereof are slightly concave until the last decollated stage is reached. From there they increase slightly in size to the middle of the spire and then again slightly decrease toward the last whorl. The whorls are slightly rounded and separated by a well-impressed suture. They are crossed by numerous very fine, hairlike, closely spaced, retractively curved axial riblets, which are about as wide as the spaces that separate them. Of these riblets, 193 are present on the penultimate whorl of the type. Periphery of the last whorl marked by a weak cord. Base short, slightly rimate, well rounded, and marked by the continuation of the axial riblets. The last whorl is solute for about one-twentieth of a turn. Aperture irregularly broadly oval. Peristome moderately expanded and reflected. Columella in the last whorl broad, hollow, and

marked by weak, retractively curved hair lines. On the last whorl it becomes a little more slender and has a slight twist.

The type, U.S.N.M. no. 543585, was collected by Miss Bourgeois at Omiltemi, Guerrero, in the Sierra Madre Mountains. It has 8.3 whorls remaining and measures: Length, 24.5 mm; greatest diameter, 7.7 mm. U.S.N.M. no. 543586, collector's no. 992, U.S.N.M. no. 543587, collector's no. 993, and U.S.N.M. no. 543588, collector's no. 983, contain 13 topotypes from the same source. Four more specimens are in Miss Bourgeois's collection.

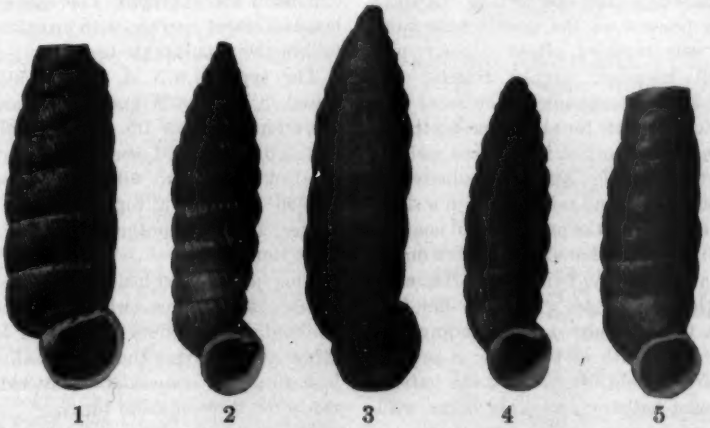
This species in size appears to resemble most closely *Coelocentrum dispar* Pilsbry, from Guatemala, from which, however, its much finer sculpture will distinguish it.

Genus **Holospira** von Martens

Holospira rehderi, n. sp.

Fig. 2

Shell small, cylindroconic, thin, semi-translucent, grayish white, with the peristome and interior of the aperture white. The nucleus consists of a little more than 2.5 whorls, which are well rounded and minutely granulose. The postnuclear whorls increase regularly in size, reaching their maximum diameter on the tenth whorl, beyond which they again decrease gradually in size. They are well rounded on the early turns but become flattened on the later whorls. The early postnuclear whorls have decidedly retractively slanting riblets, which are most numerous on the first turn where they are about one-third as wide as the spaces that separate them. Anterior to the middle of the spire the ribs are strengthened at the summit, becoming almost nodulose here. They weaken on the middle of the turns and again become strengthened near the suture, thus giving one the impression of slight obsoleteness on the middle of the whorls and granulation at the summit. Twenty-four ribs are present on the tenth whorl. Behind the aperture of the last turn the ribs become closely crowded, while on the middle of the turns they are separated by spaces about three or four times as wide as the ribs. Suture strongly constricted. Periphery of the last whorl well rounded. Base somewhat attenuated, well rounded, with a deep umbilical chink. Last whorl solute for about one-tenth of a turn. Aperture broadly pear-shaped. Peristome expanded and reflected. The columella is slender with a very slight twist. The columella bears a strong median fold in the penultimate whorl, which is about one-fourth as wide as the turn. In the antepenultimate whorl this fold becomes a little slenderer and a little wider. In this turn the parietal wall has pendent from its middle a broad lamella, which is concave above and which approximates the medial basal lamella, which is concave on its anterior side, the two leaving a mere slit between them into which the columellar fold points. The fold on the outer lip is slender and threadlike and also points toward the slit between the major lamellae. Posterior to the penultimate turn the lamellation disappears.



FIGS. 1–5.—New species of Mexican urocoptids: 1, *Oligostylus mariae;* 2, *Holospira rehderi;* 3, *Haplocion wilmoti;* 4, *Holospira morelosensis;* 5, *Coelocentrum huertai.*

The type, U.S.N.M. no. 543589, was collected by Miss Bourgeois at Chietla, Puebla, under stones. It has 14 whorls and measures: Length, 14 mm; greatest diameter, 3.9 mm. U.S.N.M. no. 543590 contains 24 topotypes from the same source. Ten additional specimens are in Miss Bourgeois's collection.

This species recalls *Holospira albertoi* Bartsch from Petlalcingo, Puebla, in the distant spacing of the axial ribs, but differs completely from that in general shape, which here is more pupoid, and also in the weakening of the ribs on the middle of the turns.

Holospira morelosensis, n. sp.
Fig. 4

Shell small, elongate-pupoid, thin, yellowish horn-colored, with the peristome and aperture white. Nuclear whorls about 2, strongly rounded and minutely granulose. The postnuclear whorls increase gradually in size up to the eighth whorl and again become slightly narrower toward the last turn. They are well rounded on the early turns and almost flattened on the broad portion of the spire, curving, however, even here toward the summit. Suture strongly constricted. The whorls are marked by strong, sublamellose axial ribs, which are a little weaker on the expanding spire than on the broader portion of the shell where they are about half as wide as the spaces that separate them. These ribs become slightly thickened at the summit which renders them almost crenulated. They are retractively slanting except on the last turn where they are vertical. Of these ribs, 51 are present on the penultimate turn. Periphery well rounded. Base slightly produced, well rounded, deeply rimate, and marked by the continuation of the axial ribs. The last whorl is solute for about one-tenth of a turn, and the solute portion is rendered carinate at the posterior angle. Aperture subcircular. Peristome expanded and reflected with a slight nodular thickening on the parietal wall near the posterior angle. The columella is twisted on the last turn and slightly twisted in the early whorls. In the penultimate whorl a median fold, rounded at the free edge and extending over almost half the width of the turn, is present. A broad parietal fold, concave on the outside, extends almost halfway across the turns, while on the basal area a fold half as wide projects toward the edge of the parietal fold. The labial fold is submedian and consists of a mere thread. All these folds are confined to the penultimate turn.

The type, U.S.N.M. no. 543591, was collected by Miss Bourgeois at Tlaquiltenango, Morelos. It has 12.5 whorls and measures: Length, 12.1 mm; greatest diameter, 3.5 mm. U.S.N.M. no. 543592 contains 10 topotypes from the same source, collector's no. 941. Five additional specimens are in Miss Bourgeois's collection.

This species does not closely resemble any of the known forms, and therefore it would be futile to attempt to compare it with them.

Genus **Haplocion** Pilsbry

Haplocion wilmoti, n. sp. Fig. 3

Shell moderately large, cylindroconic, white. Nuclear whorls 2.3, well rounded, microscopically granulose. The postnuclear whorls increase gradually in size until the sixth postnuclear turn. From there on the shell becomes cylindric, being slightly constricted on the base of the last whorl. All the whorls except the last one are marked by retractively curved lines of growth, which almost in places simulate obsolete riblets. On the last turn the base and the anterior half of the turn are marked by axial ribs, which extend into the umbilicus. Suture moderately constricted. Base well rounded, with an umbilical chink. Last whorl slightly solute. Aperture almost subcircular, broadly expanded and reflected. The columella is hollow and rather narrow, with an extremely weak fold in the penultimate turn.

The type, U.S.N.M. no. 543595, was collected by George Wilmot under large rocks in the mountain near the City of Chihuahua. It has 12.5 whorls and measures: Length, 30 mm; greatest diameter, 10 mm. U.S.N.M. no. 543596 contains a topotype from the same source, and still another is in the collection of Miss Bourgeois.

This species most nearly resembles *Haplocion semisculpta* Stearns, which also comes from Chihuahua. It differs from it in being much larger and in having the axial ribs limited to the last turn. In *semisculpta* they extend posteriorly for three or more turns.